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ICIAL PUBLICATION OF THE WIRE ASSOCIATION

STAINLESS ROD and WIRE ANNEALING AT J&L STEEL DETROIT

One of the newest applications of Lee Wilson high convection wire annealing has been made for the 400 series of stainless steel rod and wire coils at the Stainless and Strip Division of Jones & Laughlin Steel Corporation, Detroit, Michigan.

The background for this application is the many splendid installations for the same material in strip form so the design details, especially the application of gas circulation to temperature from 1550 to 1600°F., was already well developed.

This particular installation consists of a furnace and two bases with a charge diameter of 48″ and a piling height of 90″ for annealing either rod or wire coils of the 400 series, with charge weights of approximately 3600 lbs.

For types 410 and 430 cold heading material, the Rockwell B readings after annealing range from 77 to 80. With the high gas volume of circulation, these readings are the maximum spread in the charge. Since no atmosphere is used in this type of work, all materials within the furnace are made of alloy. The scale produced on the wire is very easily removed for further processing.

This application should prove of wide interest to the many plants now engaged in the expanding production of stainless materials of the 400 series.

Lee Wilson * **ENGINEERING COMPANY, INC.**
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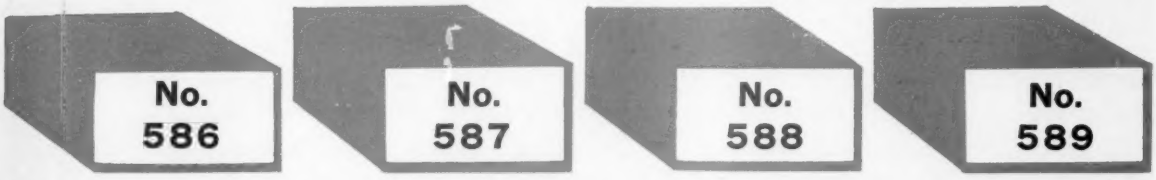

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5. **Our field service representatives are available to review this entire series at your convenience.**
6. **No. 588 is also proving an excellent mat stock lubricant where mechanical descaling of rods is desirable.**
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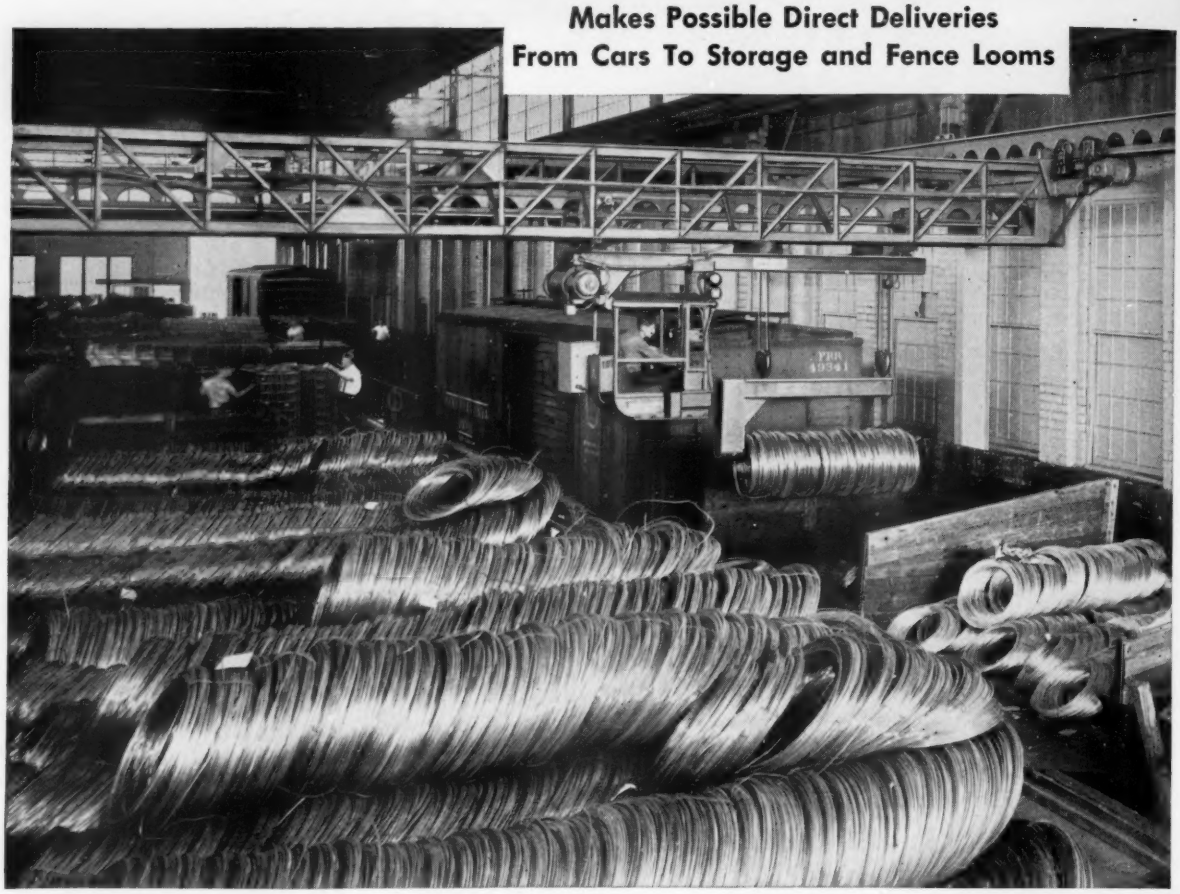

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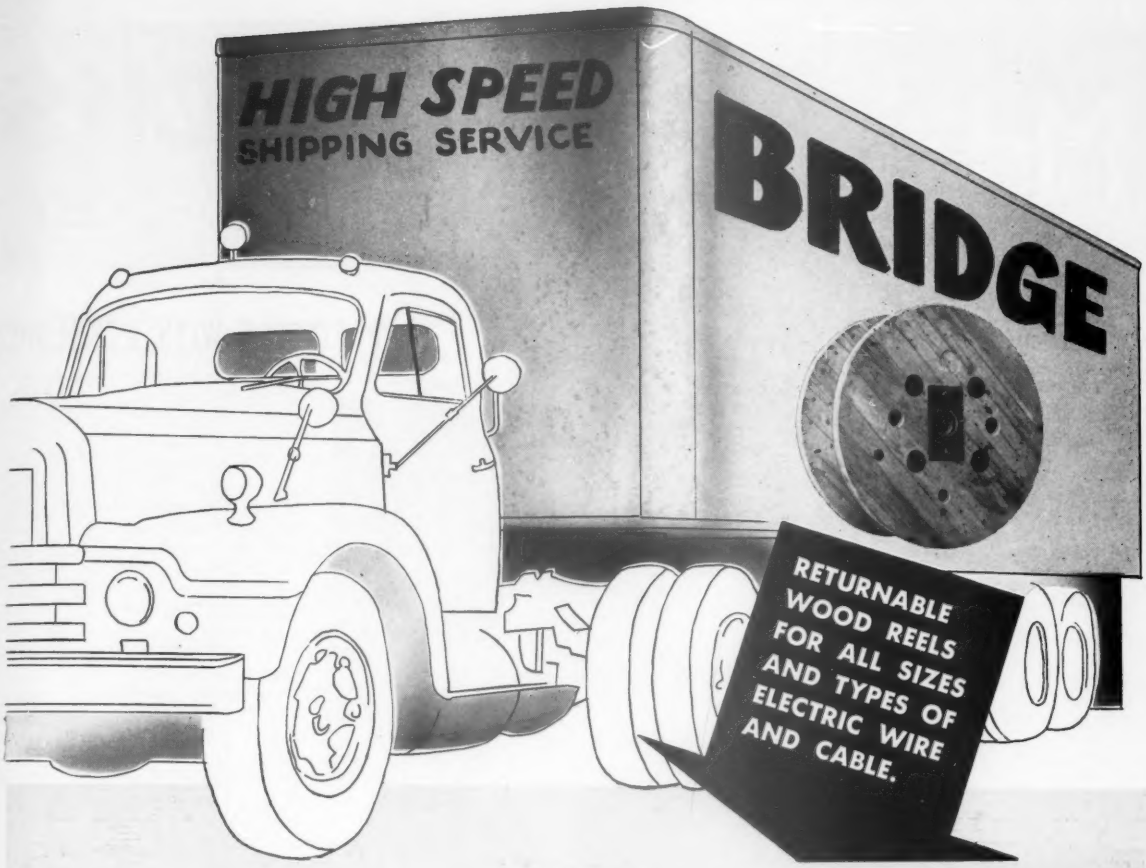

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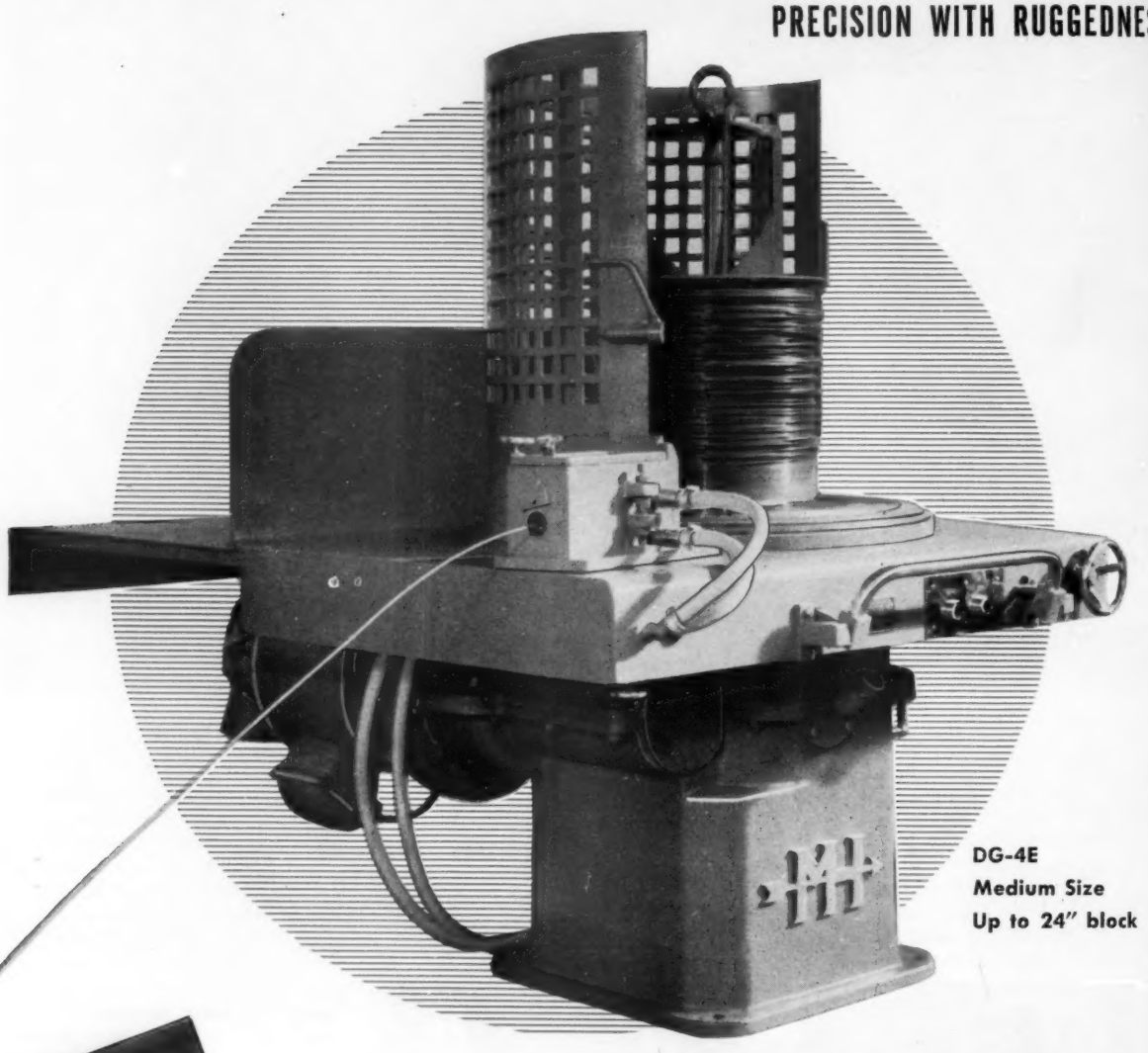

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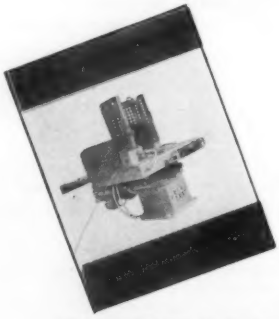

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 34 August, 1959 No. 8

Designated as Official Publication By The Wire Association

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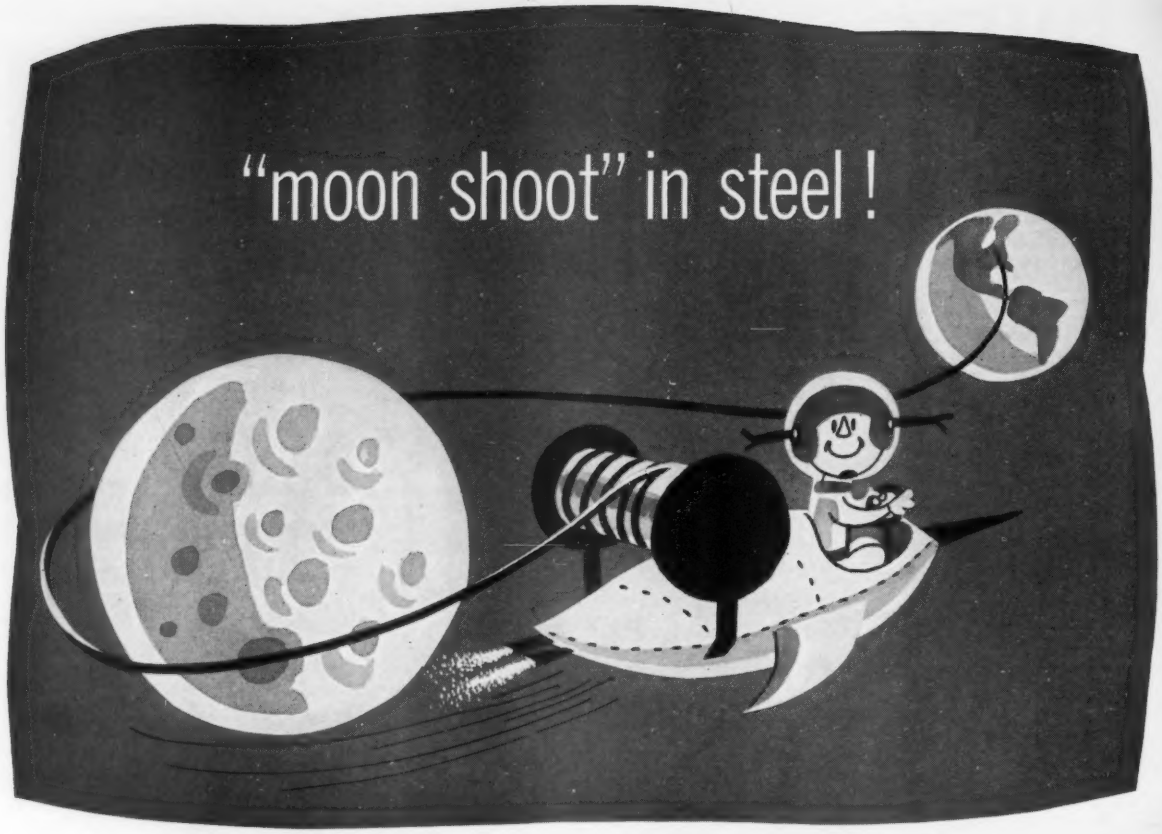

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save on pickling costs!

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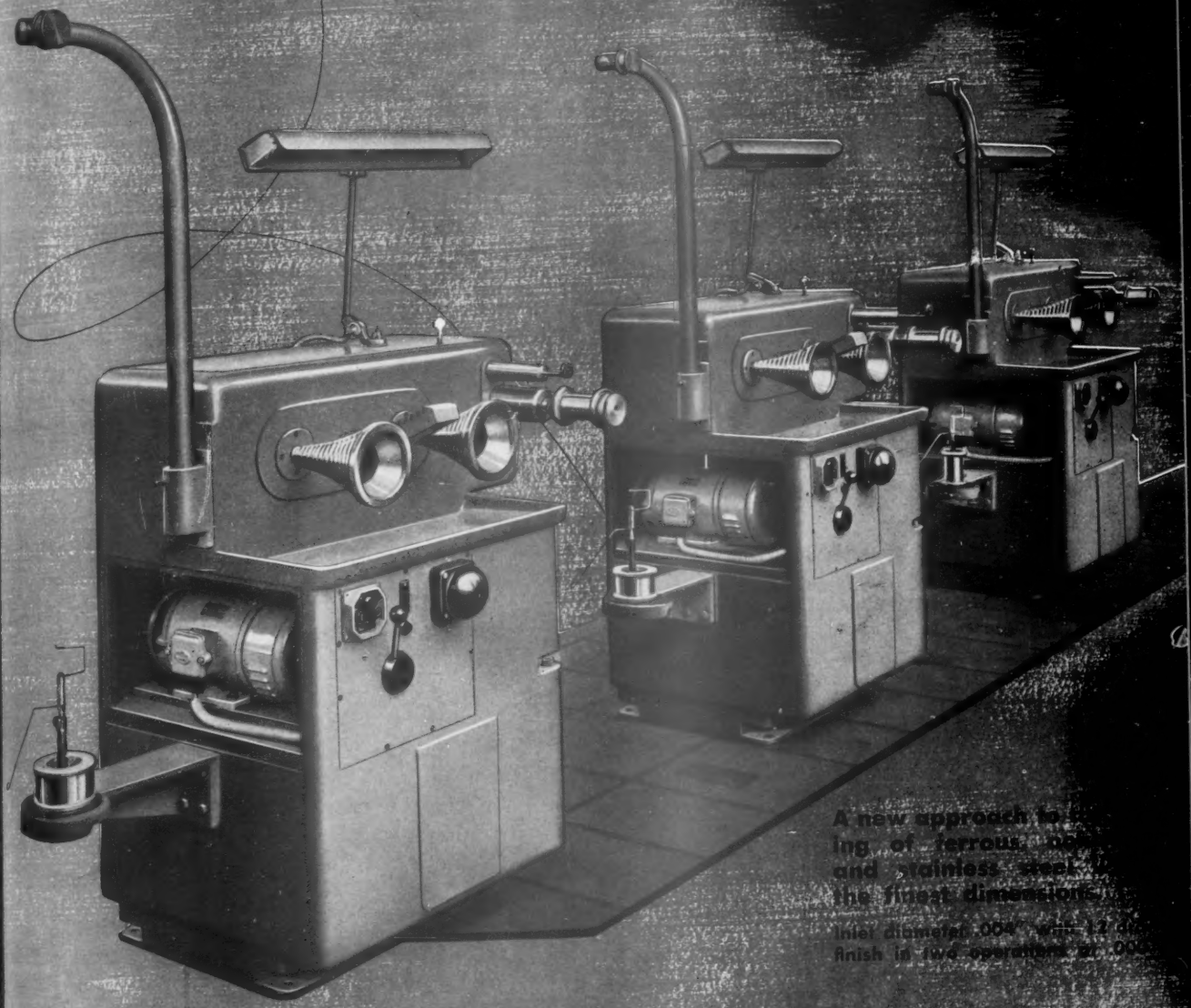

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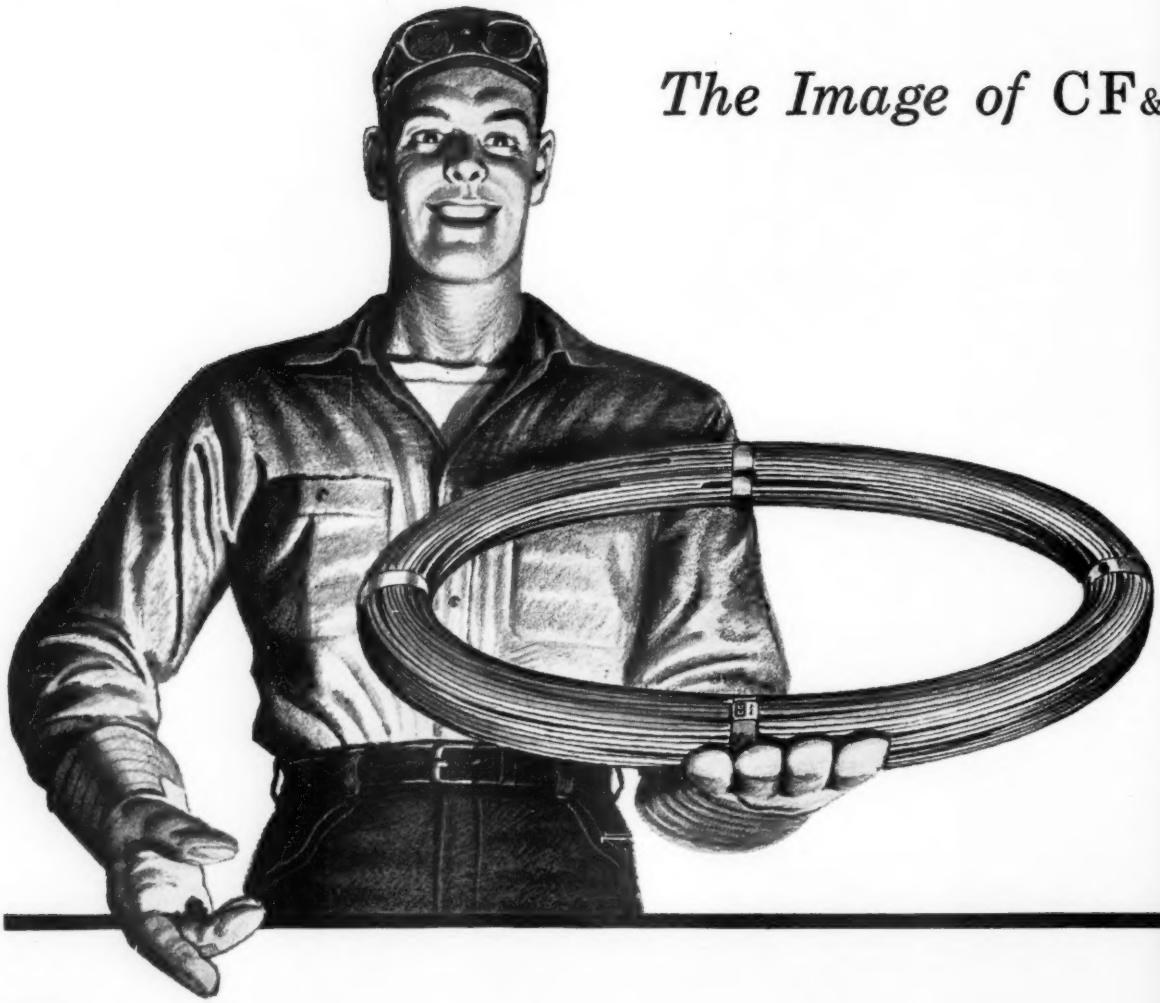

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BLACK SATIN

a unique Oil Tempered wire finish to cut your production costs

These tags show:

Heat Number_____

Size_____

Tensile Strength_____

Date_____

Coil Number_____

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This color tag system also facilitates your job of inventory control, in-plant storage, and materials handling.

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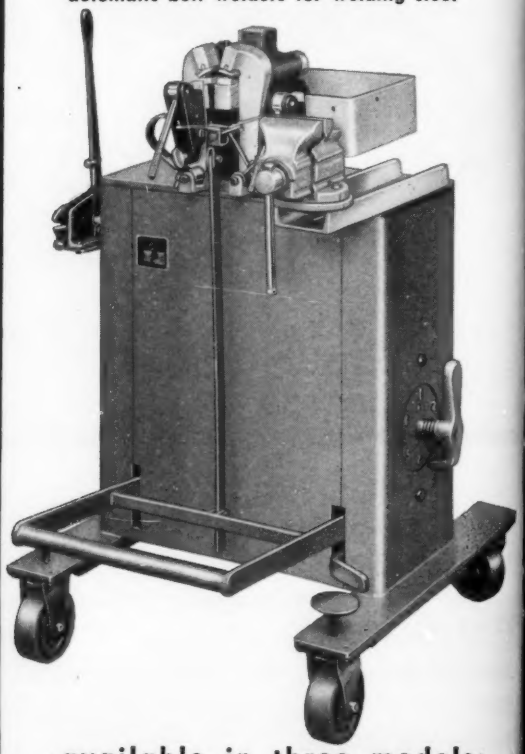

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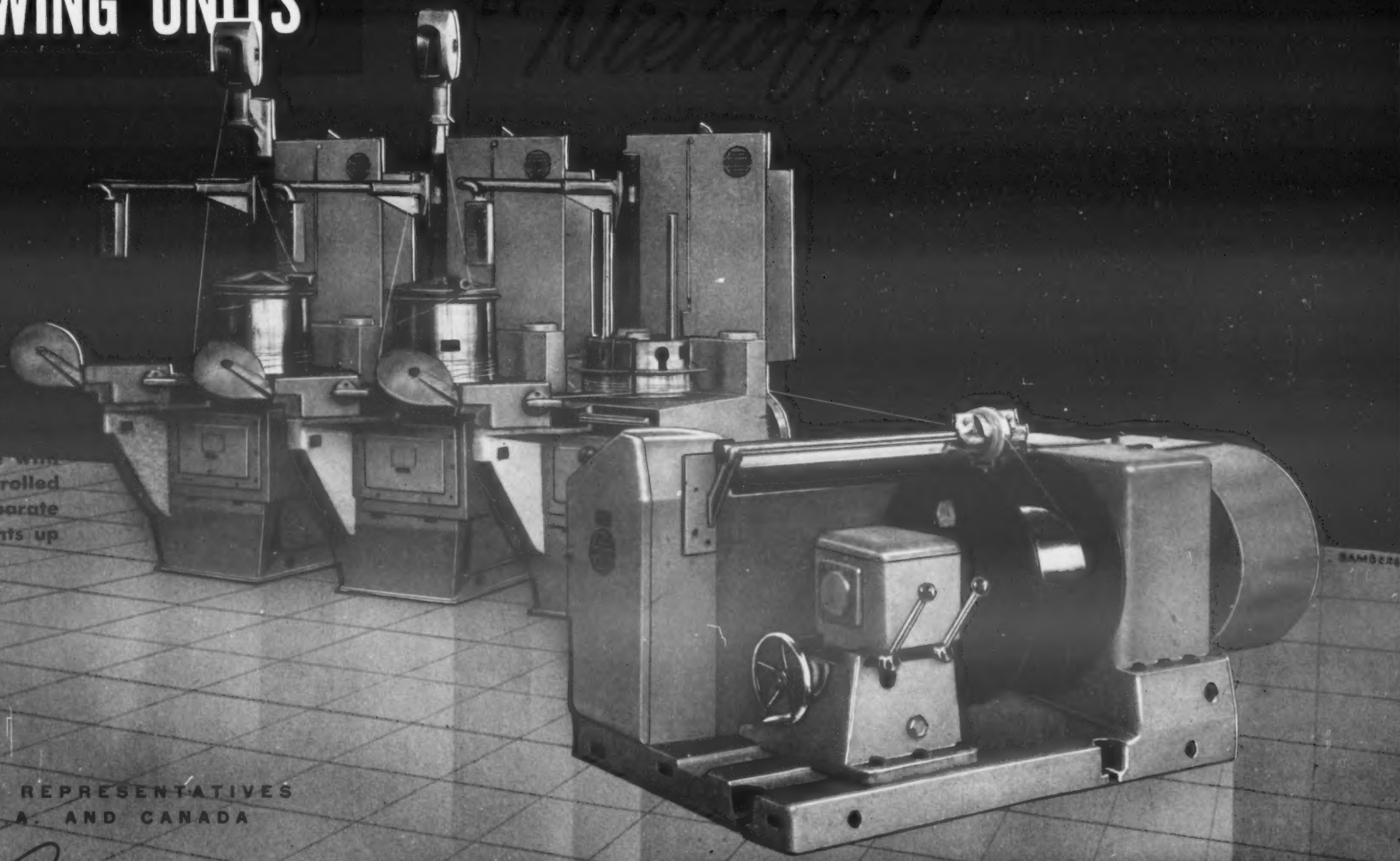

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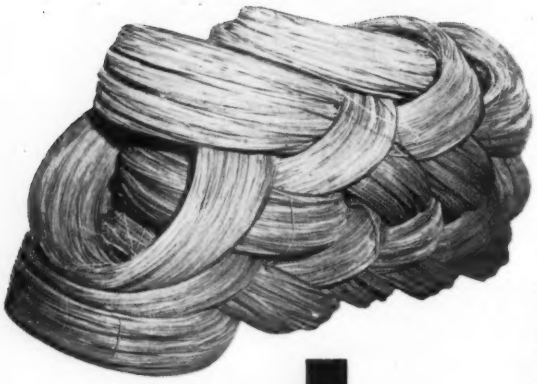

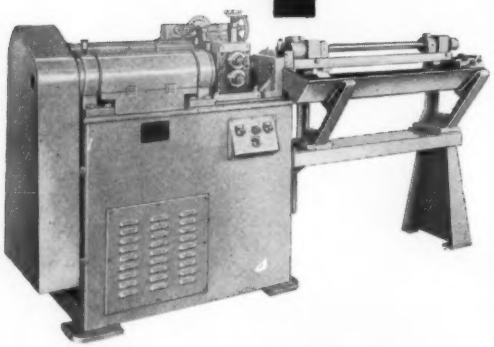

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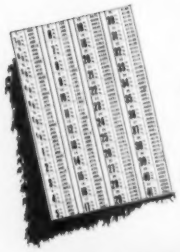

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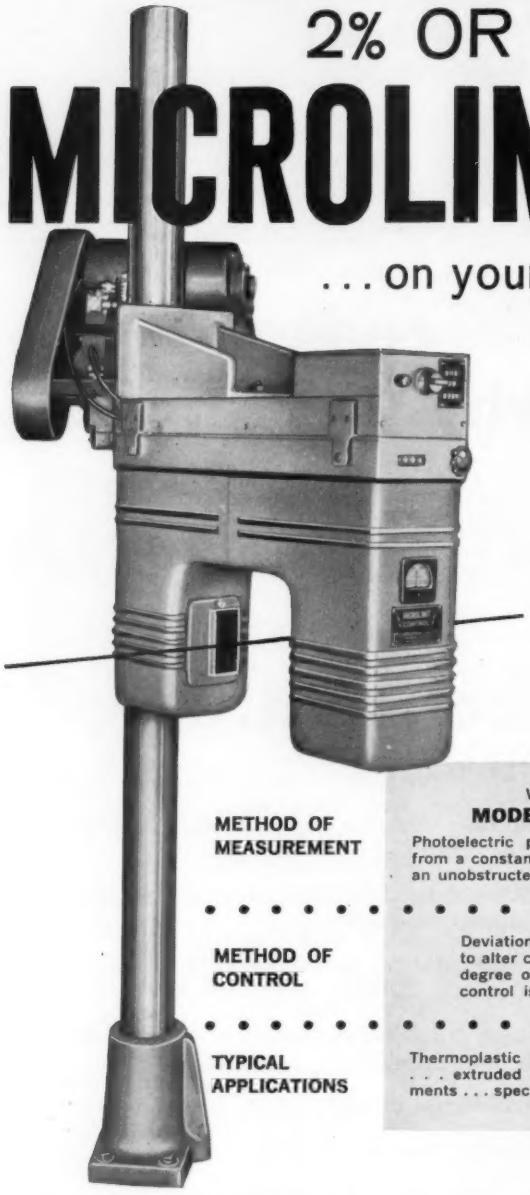

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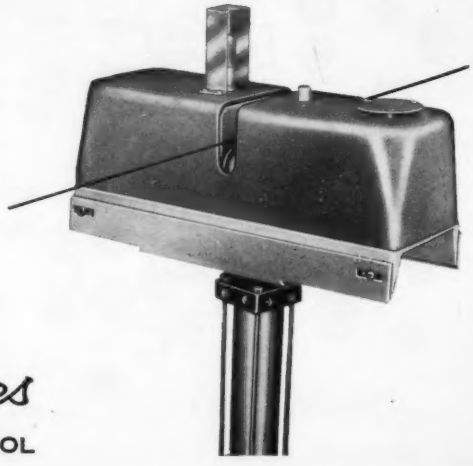

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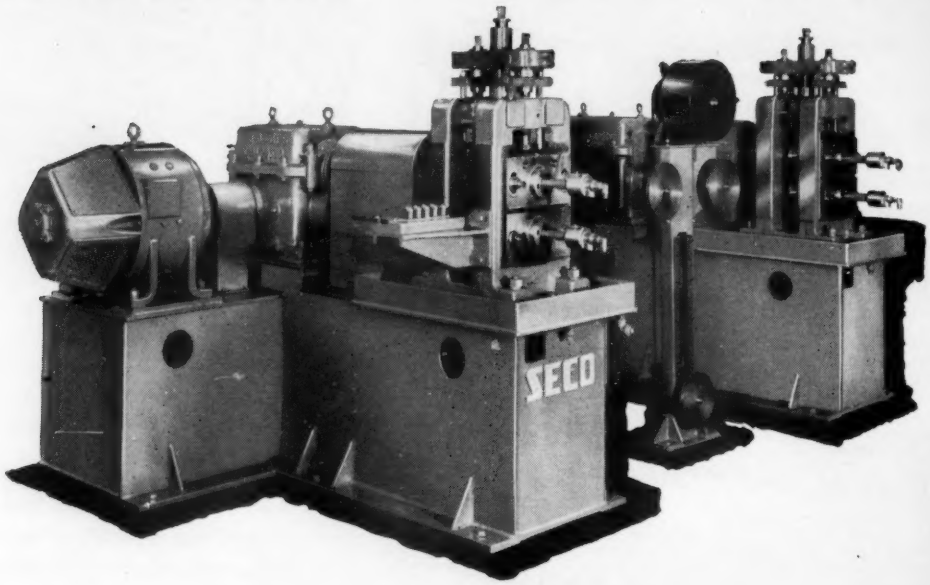
is yours when you change to

SECO WIRE FLATTENING MILLS



• Acceptable and predictable performance "on both sides of the fence" when Seco Wire Flattening Mills are used in your operation.

Seco's staff of trained engineers . . . specialists in solving production problems . . . are available for personal assistance to you. Call us today.

SECO

SECO STEEL MILL EQUIPMENT

- Leveling and Shearing Lines
- Combination Edging and Flattening Lines
- Tension Reels for Strip Polishers
- Narrow Strip Grinding Machines
- Multiple Strand Pull-out Rolls and Take-up Frames
- Strip Coilers (Up and Down Type)
- Traverse Reels for Narrow Strip
- Steel Coil Up-enders
- Scrap Ballers

STEEL EQUIPMENT COMPANY

P. O. BOX 737, WARRENSVILLE STATION • CLEVELAND 22, OHIO

AFFILIATED WITH *Lee Wilson* ENGINEERING CO., INC.

Consistent Quality Has Benefits for You

The reputation of Roebling high carbon flat spring steel is based on two uncompromising facts: its unexcelled dimensional and mechanical uniformity.

They are qualities that contribute immediately and directly to *your* increased production rates and decreased rejects.

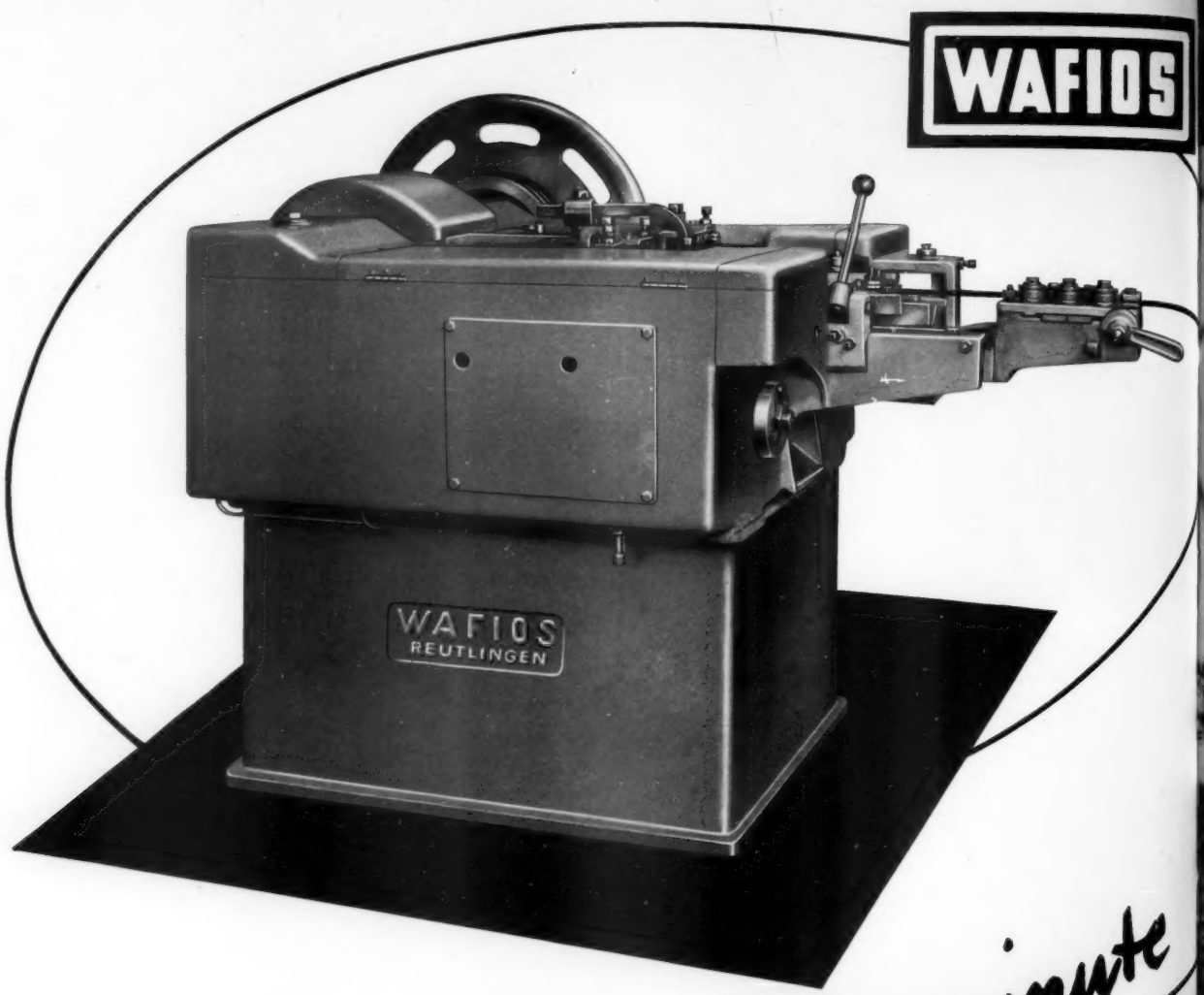
You are taking advantage of a collection of benefits when you specify Roebling. Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities · Subsidiary of The Colorado Fuel and Iron Corporation

Roebling... Your Product is Better for it

Roebling high carbon flat spring steel is used for a wide variety of parts.



. . . up to 900 nails per minute

on WAFIOS High Speed Nail Presses Types „N"
a new development of

WAFIOS MASCHINENFABRIK

Wagner, Ficker & Schmid
REUTLINGEN/GERMANY

U. S. Office: **WAFIOS MACHINERY CORPORATION, 61 Hudson Street, Hackensack, New Jersey**
Telephone: HUbbard 9-7577

LET'S TALK WIRE!

These lock washers are typical of many types and sizes of lock washers made from PAGE wire—and lock washers are just one of the many end products for which PAGE manufacturers wire is a logical choice.

Regardless of your use of wire, you can count on PAGE uniformity. Whether you make hairpins or lock washers, PAGE wire will give you the tensile strength, ductility, finish, tolerance and other properties you require.

PAGE facilities are designed to produce a wide range of high quality manufacturers wire items—including special shapes. Where requirements are exacting, you will find PAGE wire unexcelled.

Since 1902, we have pioneered many "firsts" in the wire industry. The latest of these is corrosion-resistant ACCO *Aluminized* Wire—commercially pure aluminum bonded to a steel core.

Why not put PAGE experience and knowledge to work for you to improve your product and lower your costs.

PAGE MANUFACTURERS WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

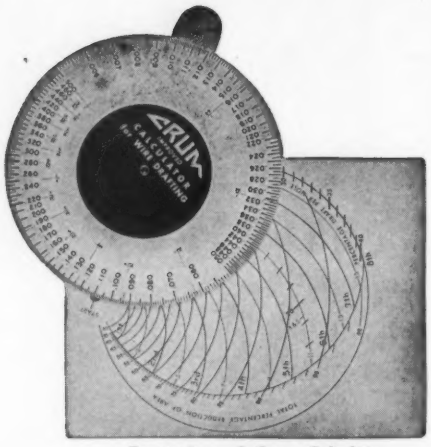
PAGE *—the source for answers to wire problems*

SAVE SET-UP TIME WITH THE . . .

CRUM CALCULATOR

FOR WIRE DRAFTING

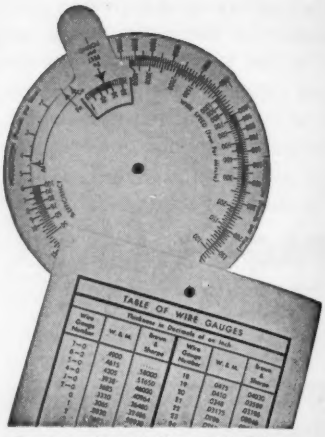
Useful and Accurate!



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

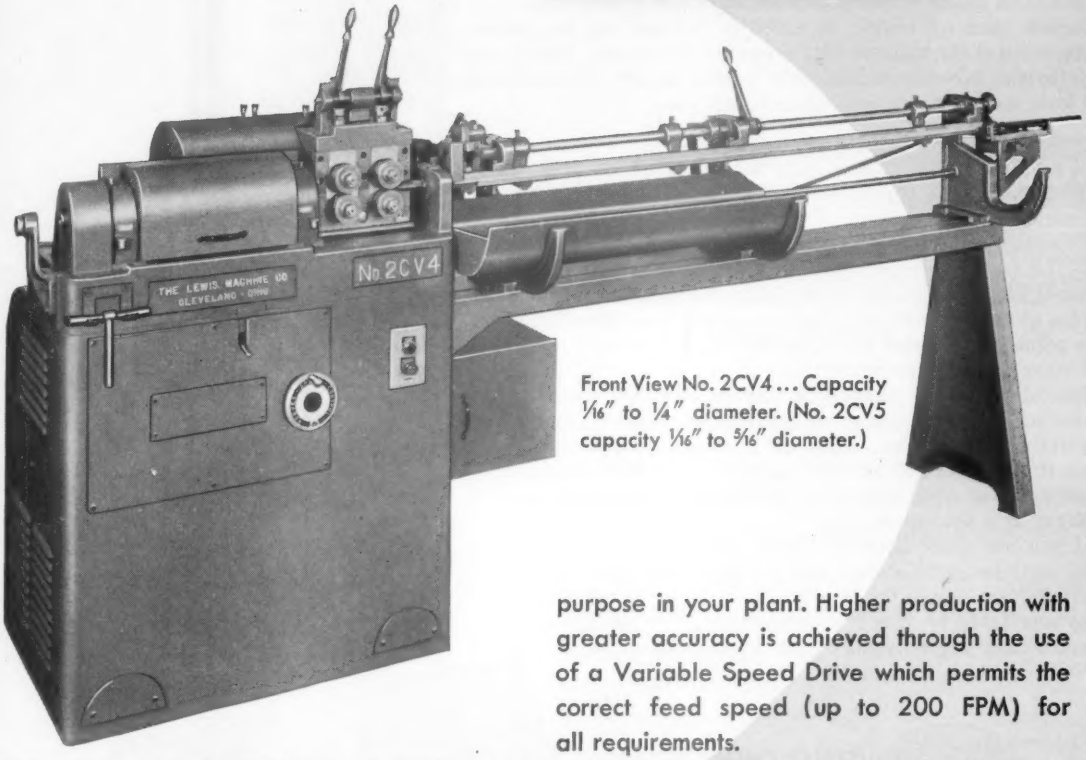
WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

THE NEW **LEWIS** *Convertible**

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES WITH VARIABLE SPEED DRIVE AND DUAL-CENTER STRAIGHTENER ARBOR



Front View No. 2CV4 ... Capacity 1/16" to 1/4" diameter. (No. 2CV5 capacity 1/16" to 5/16" diameter.)

* The new Lewis No. 2CV series is equipped with our Dual-Center Rotary Straightener Arbor and can be quickly converted to handle shapes by installing our interchangeable Roll Straightener.

This convertible feature introduces a new flexibility in wire straightening and cutting operations ... one machine can serve a double purpose in your plant. Higher production with greater accuracy is achieved through the use of a Variable Speed Drive which permits the correct feed speed (up to 200 FPM) for all requirements.

The outstanding feature of this series is the DUAL-CENTER STRAIGHTENER ARBOR (Pat. Pending) for round wire. This feature increases the range of the machine and makes it possible to precision straighten small diameters below the capacity of other machines.

Other models available to handle .012" to 1" diameter, as well as shapes.

THE LEWIS MACHINE COMPANY

3441 East 76th Street • Cleveland 27, Ohio • A Division of Curtis Mfg. Co.

ANNOUNCING NEW U.S.I. PLANT FOR COMPOUNDING PETROTHENE® RESINS

New Tuscola, Ill., polyethylene compounding unit can process 25 million lbs. per year, guarantees top quality control in resin compounding.

With special process procedures and equipment in its new plant, U.S.I. has achieved a new high in control over compounding factors affecting polyethylene resin performance. This assures manufacturers of maximum weather resistance from PETROTHENE resins for outdoor wire and cable applications.

Carbon black, of course, is added to polyethylene to prevent degradation of the resin on long exposure to sunlight. Without it, polyethylene becomes increasingly brittle at low temperatures and loses its resistance to outdoor weathering.

Factors Affecting Weathering

How well carbon black retards aging, or weathering, depends on three factors: (1) type and particle size of carbon black; (2) percentage of carbon black in the compound; (3) dispersion of carbon black in the polyethylene.

At U.S.I.'s new compounding plant, only "channel black" carbon black of the finest particle size is used in the wire and cable grades of PETROTHENE polyethylene resins. Concentration is set at a point which yields the optimum balance of light screening and other performance properties.

Special processing equipment insures thorough dispersion of the carbon black throughout the polyethylene. This is particularly important, since carbon black gives maximum protection only when it is well dispersed. For example, tests show that a good dispersion will withstand 15 to 20 times as much exposure to sunlight as a poor dispersion.

If you use black electrical grade polyethylene in your products, we'll be glad to send you our new four-page data sheet, "PETROTHENE Resins for the Wire and Cable Industry". Also available is U.S.I.'s comprehensive 100-page "PETROTHENE Polyethylene . . . A Processing Guide". Write us at the address below for your copies.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
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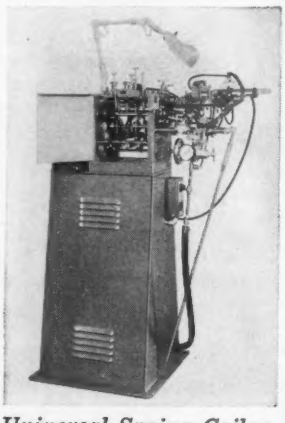


No. 0 Universal Spring Coiler, Escapement Type, Series 720, with Automatic Looper

NOW COIL and LOOP

IN ONE OPERATION

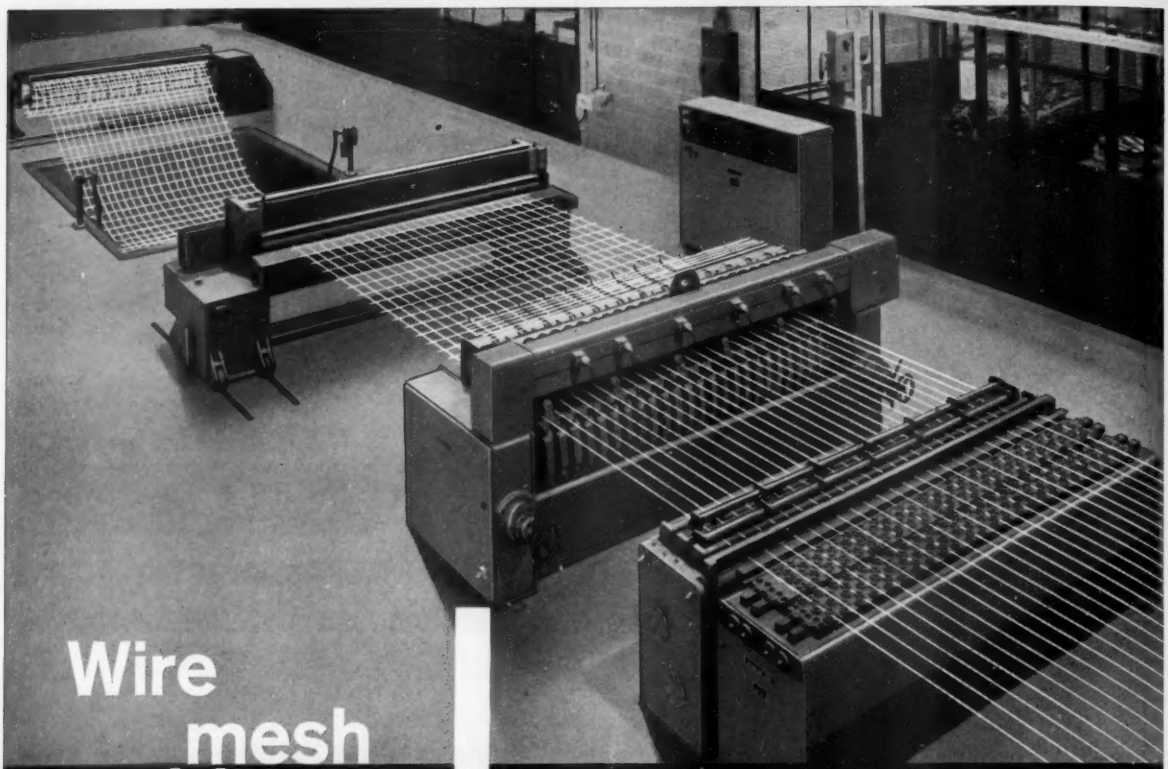
AUTOMATICALLY

Here's a completely new combination spring coiling and looping concept that does away with all secondary operations. It will automatically produce accurately formed extension springs with both ends looped. It is designed as an attachment for the S&H #0 Universal Spring Coiler, Escapement Type. The unit is capable of handling springs ranging in length from four coils up to the maximum wire feed capacity of the coiler.

Find out how this S&H combination unit can help you with your volume spring production. Write, Wire or Phone Collect for further information—Today.

SLEEPER & HARTLEY INC.
335 CHANDLER STREET
WORCESTER 1, MASS., U.S.A.
ORIGINAL MANUFACTURERS OF UNIVERSAL SPRING COILERS

"A recent North American Installation"



Wire mesh welder

for the manufacture of welded fabric sheets and rolls

Advantages of the welder

Quick change from one mesh size to another.
Infinitely variable cross and longitudinal wire pitch for any mesh dimension.
Minimum wear of the large-surface electrodes by suitable electrode shape and material, as well as efficient air cooling.
Maximum power factor of the transformers as a result of minimum inductive losses.
Three-phase connection to the mains supply. Electronic current switching by IGNITRON high-power tubes avoiding current surges.
No tearing of the welded mesh and no electrode burning when feeding bent cross wires since the welder stops automatically in such a case.
Effective cushioning of the carriage impact.
Minimum maintenance and servicing thanks to permanent lubrication of all gliding and rotating parts. Automatic oil fog lubrication of all air presses.
Automatic and interlocked sequence of operations and, therefore, always minimum duration of the total welding cycle.
Electrode pressure at every welding spot and feed power are infinitely variable.
Available with attachment for welding three different and preselectable cross wire pitches.

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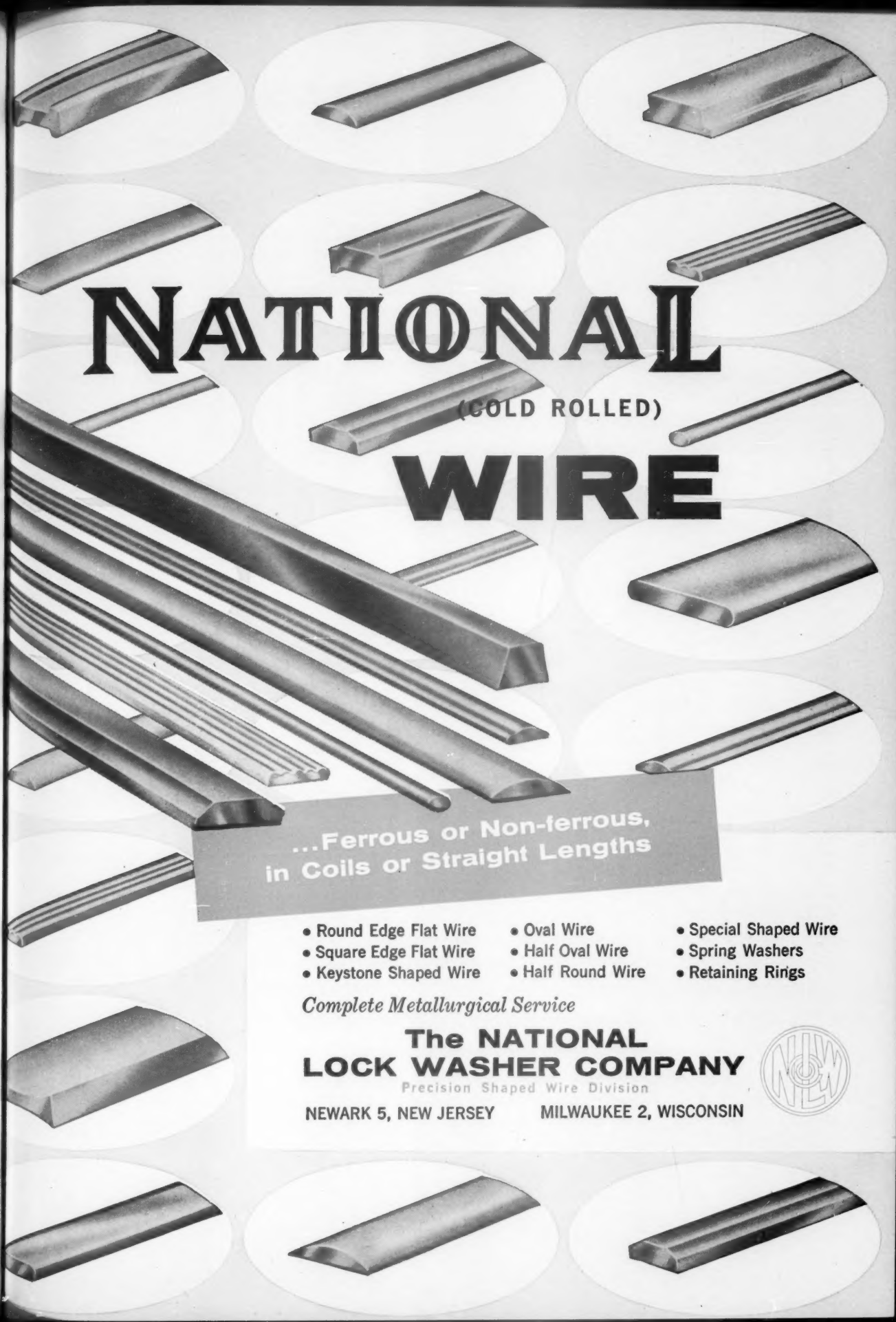
P. REICHER - Machinery and Equipment
P. O. Box 127, Willowdale, Ontario, Can.

H. A. SCHLATTER LTD. ZOLLIKON/ZURICH
Manufacturers of electric welding machines (Switzerland)


NATIONAL
(COLD ROLLED)
WIRE
...Ferrous or Non-ferrous,
in Coils or Straight Lengths
• Round Edge Flat Wire
• Square Edge Flat Wire
• Keystone Shaped Wire
• Oval Wire
• Half Oval Wire
• Half Round Wire
• Special Shaped Wire
• Spring Washers
• Retaining Rings
Complete Metallurgical Service
The NATIONAL
LOCK WASHER COMPANY
Precision Shaped Wire Division
NEWARK 5, NEW JERSEY
MILWAUKEE 2, WISCONSIN

WHY MOCO WIRE PROCESSING EQUIPMENT IS YOUR FINEST LONG RANGE INVESTMENT

Magnet wire processing equipment as developed, designed and manufactured by Michigan Oven Company incorporates the same principles of controlled convection and recuperative catalytic incineration which we pioneered and developed for other heat processing applications.

After years of concentrated research and coordinated effort with magnet wire manufacturers, MOCO equipment has been accepted as the finest investment possible in long lasting wire production machinery.

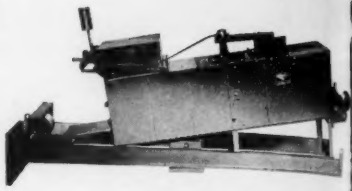
The techniques used are the very latest.

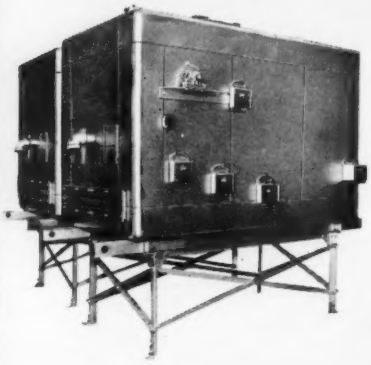
The equipment has been fully tested under the most exhaustive production runs. Michigan Oven Company is aware of all the problems and will cooperate in recommending the proper equipment for specific needs—and, of course, will render special engineering service for unusual applications.

The equipment shown is a partial view of MOCO's wire processing line. Your inquiry on all types of magnet wire processing equipment is welcomed and will be given immediate attention.

SELF GENERATING ATMOSPHERE ANNEALERS

This is the first gas-fired annealer using the heating equipment as an internal inert atmosphere generator. Advanced mixing and burning equipments are utilized which exclude the need for external sources of steam or costly inert atmospheres. Available in horizontal or vertical mounting positions.



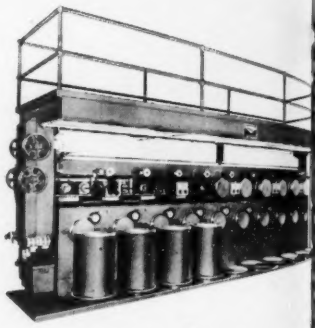


HORIZONTAL WIRE ENAMELING OVENS

These horizontal fine wire enameling ovens for either gas or electric heating operate on MOCO's high velocity recirculating principle. They are equipped with internal catalysts insuring low fuel consumption, freedom from condensation and elimination of objectionable exhaust fumes. Accessories such as enamel applicators and sheaves are available.

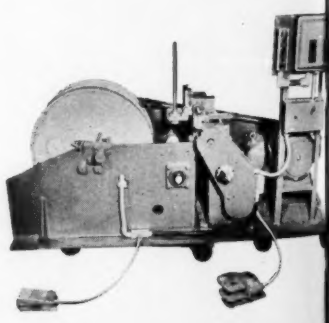
UNIVERSAL REEL OR DRUM PACKER

MOCO was first to develop and install a universal wire packaging machine with combination takeup unit permitting packaging of wire on 6" or 12" diameter spools or in either 100 lb. capacity pails or 500 lb. capacity barrels. Packaging arrangements are optional from spindle to spindle without machine alteration.



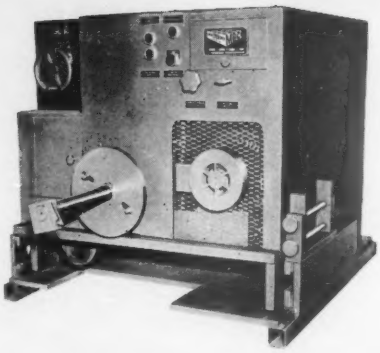
SPECIAL REELERS

High speed, heavy-duty wire traversing takeups for heavy round and rectangular conductors. Reel capacity up to 1000 lbs. and speeds up to 500 feet per minute. A variety of drives are available for tieing in to various types of equipment.



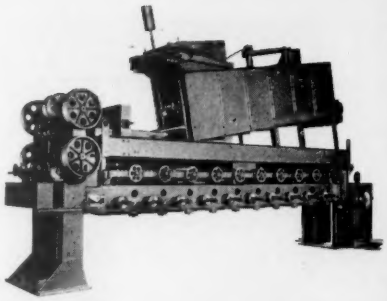
LEVEL WINDERS

aversing reel type, er wind takeups for avy round and rec- ngular conductors. finitely variable trav- e adjustments over wide range of wire es. Reel capacity – 0 lb. maximum. Wire eed – up to 100 feet r minute.



HEAVY ROUND AND RECTANGULAR TAKEUP

Four strand takeup unit for heavy round and rectangular conductors, with preannealing ovens mounted on top. These units are available up to 6 strands, with either dual capstan or fleeter ring assemblies.

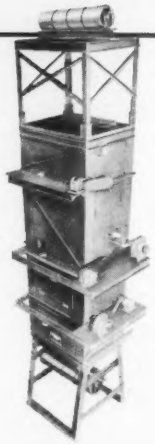


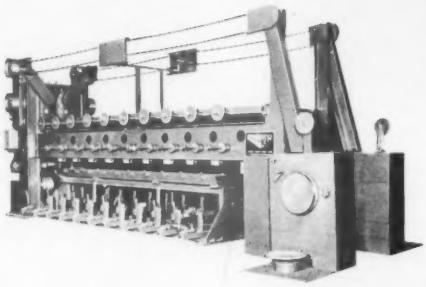
WIRE OVENS

tal fine ovens for electric rate o velocity rinciple ped with ts insur- onsump- rom con- elimina- nable ex- cessorie applica- ves are

VERTICAL WIRE ENAMELING OVENS

is vertical two-zone gh velocity axial flow irculating wire enam- ing oven has internal uperative catalytic it which eliminates ndensate and recovers ent solvent energy. e other models com- te the range from the est wire through large ectangles.



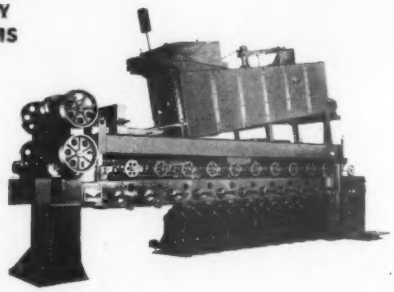


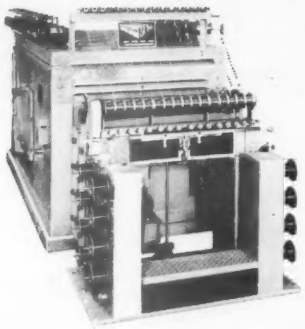
INTERMEDIATE SUPPLY AND TAKEUP MECHANISM

20 Line takeup and supply stands for wire sizes .0089 to .025, inclusive. These units are also available with any number of auxiliary barrel packing units. Designed for operation with the vertical wire enameling oven shown opposite. Custom engineering for special spooling requirements is available.

NAMELED WIRE SUPPLY D TAKEUP MECHANISMS

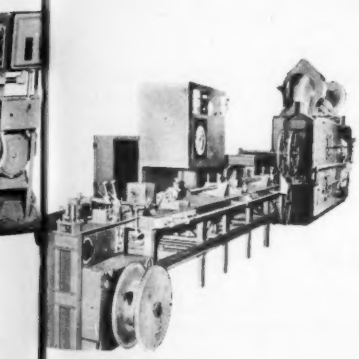
Line Heavy-duty oolers for wires up and including .072 meter. These units y be equipped with y number of aux- ary barrel packing its and provide for ounting supply stands neath and preanneal- g oven on top. Vari- s arrangements are ailable for special rposes.





FINE WIRE ENAMELING MACHINE

Typical of the complete line is this type "B" machine which handles wire from 31 A.W.G. to 42 A.W.G. Five other models complete the range from the finest wire through large rectangles. The horizontal, high volumetric, recirculating double-pass oven allows greatly increased production by rapid heat impartation and a high degree of temperature uniformity.



TEXTILE INSULATING AND IMPREGNATING MACHINES

MOCO was first to develop and install rapid heat-cool tunnel type varnish impregnating ovens. This MOCO double insulating machine and layer wind takeup applies two servings of glass or yarn and four coats of baked insulating varnish simultaneously to heavy rounds and rectangulars. Quick starts and stops are accomplished without production loss.

MICHIGAN OVEN COMPANY

MOCO

WIRE EQUIPMENT DIVISION
425 Brainard Street
Detroit 1, Michigan

Please send me complete information on the many outstanding MOCO features:

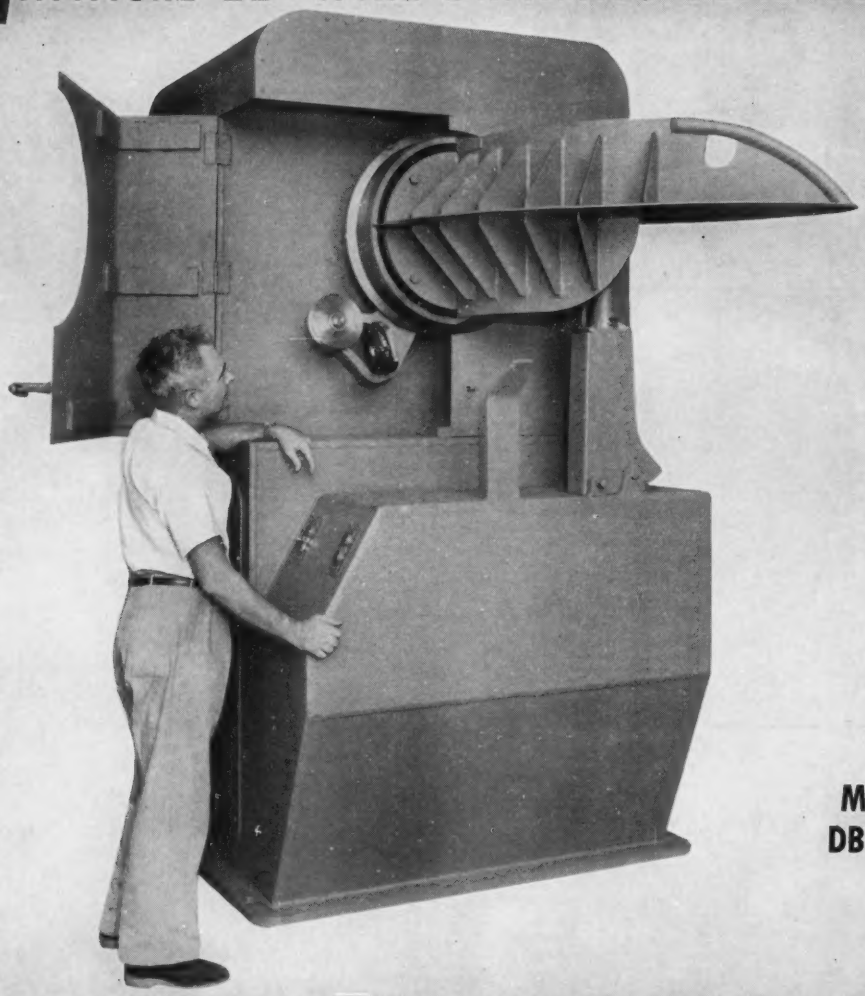
- ☐ Wire Enameling Machines
- ☐ Glass Insulating Machines
- ☐ Other
- ☐ Self-generating atmosphere Annealers
- ☐ Reel-R-Drum Packers

NAME_____ TITLE_____

COMPANY_____ ADDRESS_____

CITY_____ ZONE_____ STATE_____

WHITACRE 22″ WIRE DRAWING DEAD BLOCK



Model
DB-22A

Continuous Production—Efficiency Approaching 100%

Gives you these advantages

Continuous increased production achieved by: • No down time for stripping • Permits packaging into stationary container or uninterrupted palletizing on stems • No tangling nor snarling from handling • Design simplicity. No back-gearing nor similar mechanisms • Greatly reduced floor space requirements • Dies in supplying drawing machine can be changed without stopping dead block • Accumulation type machines can be "run down" without stopping dead block • Continuous inspection and sampling • Breaks welded in production — low scrap loss • Increased production with lessened operator fatigue • Maintenance eliminated except for occasional lubrication of four main bearings and two motor bearings • Dead block can be located anywhere with wire literally piped from wire drawing machine • Extra large packages for in-process wire • Greatly reduced handling and in-plant transportation costs • Low capital investment.

OTHER MODELS AVAILABLE

16″ Wire Drawing Dead Block, Model DB-16A • 26″ Wire Drawing Dead Block, Model DB-26A • Combination 16″ and 22″ Galvanizing or Tinning Dead Block Take-ups, Model GB-2216A • 26″ Heavy Wire Galvanizing or Tinning Dead Block Take-up, Model GB-268.

Write Today For Specifications And Name Of Nearest Distributor

WHITACRE ENGINEERING & MANUFACTURING COMPANY

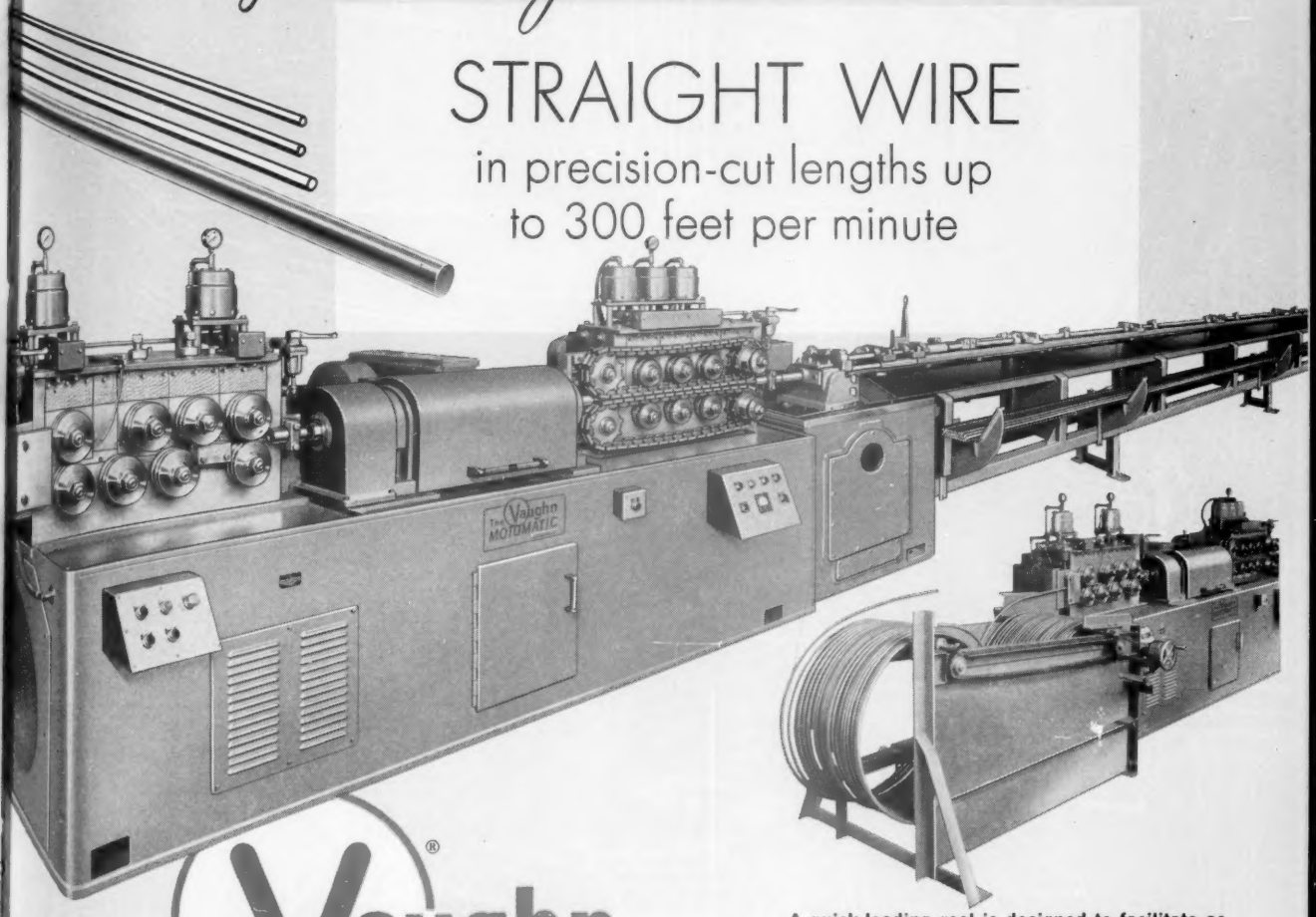
5649 ALHAMBRA AVENUE • LOS ANGELES 32, CALIFORNIA • CAPITOL 5-2476

WHITACRE

Designed with Your Needs in view...

STRAIGHT WIRE

in precision-cut lengths up to 300 feet per minute

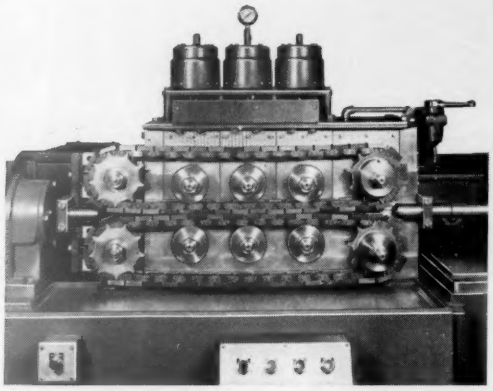


A quick-loading reel is designed to facilitate accurate starting of wire coils into chain feed . . . and to protect the operator from the revolving pay-off coil.

The Vaughn® MOTOMATIC

Wire Straightening and Cutting Machine

Features **electric variable speed drive,** with full range speed control at operator's station . . . **adjustable center straightener arbor** that accommodates wide range of wire sizes . . . **caterpillar chain feed** which eliminates twist and processes entire coil, end-to-end . . . and an **accurately synchronized flying shear cut-off.** Keeps scrap to minimum . . . reduces labor, time and fatigue . . . and delivers uniform diameter and precision-cut lengths of straight wire. • Full details in Bulletin 751—write for your copy. Consultation and quotations gladly provided on request.



The caterpillar chain feed grips wire firmly without distortion, eliminating twist . . . and feeds the entire coil ends through the machine, saving wire scrap and operator time.

The VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

Wire Quality Starts Here

Melt shop origin is an infallible guide to **consistent quality** in stainless steel wire.

J&L craftsmanship and modern equipment for hot rolling, cold finishing and final processing rely on melt shop quality to **consistently** meet your most exacting specifications.

J&L leads the industry in melt shop standards for stainless steel—the point where consistent quality starts **and better wire products begin.**

J&L

STAINLESS

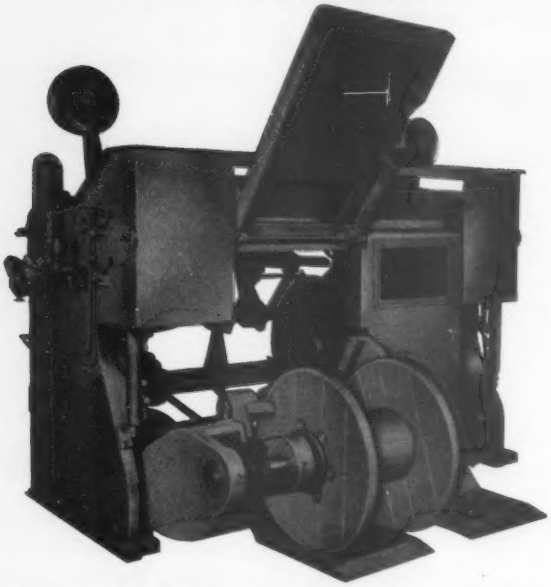
SHEET • STRIP • BAR • WIRE

Plants and Service Centers:

Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

NEW HIGH-SPEED DUAL REEL TAKE-UP



Model DR-24HS Continuous Reeling of Insulated Wire at up to

4000 FPM

The new Davis-Standard high-speed Dual Reel Take-Up is designed to handle the lighter gauge wires at up to 4000 feet per minute with positive, clean cut-over at full wire speed.

DUAL MOTOR DRIVE — The empty reel is running at exact wire speed during cut-over. Only a dual motor drive permits the empty reel to spin faster than the full reel so that drum speed matches full reel build-up.

PATENTED RETRACTABLE WIRE GUIDE — Completes lay on full reel while main wire guide traverses at normal speed to empty reel starting position.

FRICTION DISC REEL DRIVES — Engage reels in any position, eliminate line-up of dog pin holes. Double pintles clamp both sides of each reel for smooth, high speed revolution without end play.

COMPLETELY AUTOMATIC GUARDING — Cannot be opened until full reel has stopped. Closes before reel drive starts.

For complete details on the new high-speed Dual Reel Take-Up Model DR-24HS for 12 to 24 inch diameter reels

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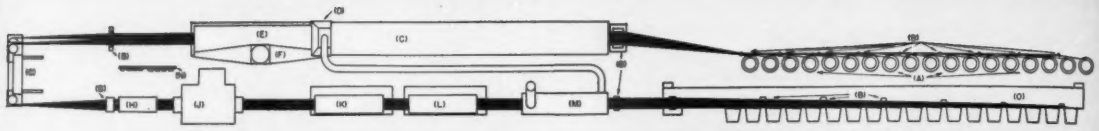
In Canada contact E. V. Larson Co. Ltd., 572 Queen St. East, Toronto 2, Ontario/in Europe and the Sterling Area contact Fawcett, Preston & Co. Ltd., Bromborough, England/in California, Oregon and Washington contact Ed. J. Lynch, P.O. Box 3043, Santa Ana, California.

A NEW TWIST TO WIRE MAKING



A. PAY-OFF SWIFTS
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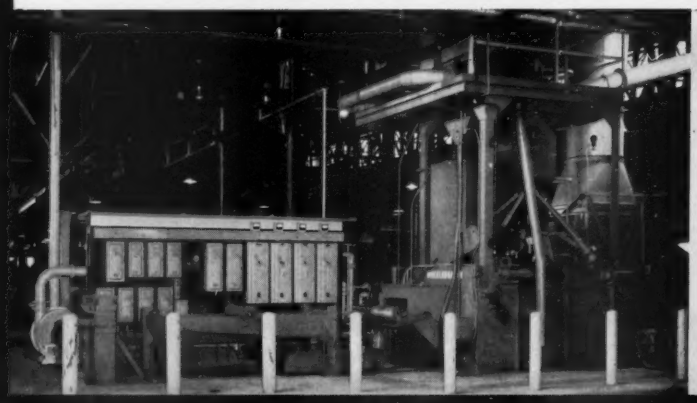
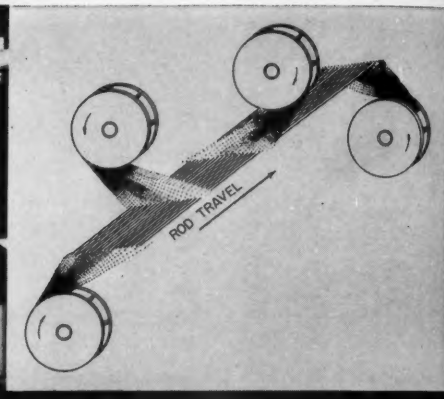
C. FURNACE
D. COLLECTING HOOD
E. LEAD BATH
F. EXHAUST HOOD
G. TURN AROUND
H. WATER COOLING BATH
J. WHEELABRATOR MACHINE
K. BORAX COATING BATH
L. LIME COATING BATH
M. DRYER
N. CONTROL PANEL
O. TAKE-UP FRAME





ROEBLING continuous wire production based on WHEELABRATOR® blast cleaning

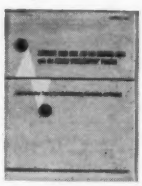
Continuous patenting, cleaning and coating of steel wire adds up to more efficient operation at lower cost, for John A. Roebling's Sons Corp.

The new processing line, installed at the Roebling mill, incorporates Wheelabrator airless blast cleaning as a key step in the operation. Wire now is patented and cleaned in one continuous operation, with a resultant decrease in labor cost.

Eighteen strands of steel wire pass simultaneously through the muffle furnace, lead quenching bath, Wheelabrator blast cleaning machine, coating baths, drying ovens, and thence to the take-up frame, in a compact operation occupying an area of 250 ft. long and 30 ft. wide. Normal production rate is about 6,000 pounds per hour. Speeds through the blast cleaning unit vary with the gauge of wire, with .250" diameter rod running at 34 fpm.

Wheelabrator mechanical cleaning eliminates the costly problems of acid disposal, and maintenance of acid pickling equipment. By promoting efficient "straight-line" production, it minimizes handling costs. The combined effect of cleaning and labor savings is a considerable reduction in the patenting and cleaning cost.

Write for Bulletin 148-D, illustrating use of the Wheelabrator process for producing finished wire from hot rolled rod in one continuous operation.



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Water-absorbing salt, generally used as a coagulant following polymerization, is eliminated in the manufacture of Naugapols. Extra straining and milling further remove all water-solubles from the dried polymers, yielding easy-processing rubbers noted for their:

- HIGH DIELECTRIC PROPERTIES
- LOW MOISTURE ABSORPTION
- LOW ASH CONTENT

These are the qualities that make Naugapol polymers so strongly preferred by manufacturers of rubber-insulated wire and cable, mechanical rubber goods and other rubber products requiring high electrical insulating qualities and excellent mechanical characteristics over a wide temperature range.

*Naugapols are made in types 1016, 1018, 1019, 1021, 1022, 1023, 1503 and 1504.

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Good news in Anti-friction action...

SWIFT now offers a FAMILY OF FIVE . . .

Swift's new line of high heat resistant, long mileage lubricants are now available to serve a variety of drawing and metal processing jobs.

Flexals are extremely versatile. A wide range of chemical and physical properties makes them particularly adaptable for difficult or highly specialized jobs. For example: Flexals can be furnished for cold heading, hot dip coating and dry drawing of high or low carbon wire. They can be soluble in water . . . or *insoluble* in both water and solvents. Melting points range to 800° F. They are offered in controlled grinds down to micron particle size.

Look over Swift's new *Family of Five* FLEXALS . . . with *your* process in mind. Then, write for details on a trial order of these versatile new ANTI-FRICTION lubricants.

FREDDIE FLEXAL invites your further inquiry.

FLEXAL S	Hot dip, dry film lubricant and rich, dry drawing compound.
FLEXAL CS	Fine calcium stearate; 58°-60° C. titer, 325 mesh.
FLEXAL MCA	Metallic stearate base. Medium vari-grind compound.
FLEXAL MCF	Metallic stearate base. Rich, fine mesh drawing compound.
FLEXAL MCL	Lean, fine, dry lubricant for low carbon bright and cold heading wires.

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Samson Spring Wire is custom made with the correct finish, temper and tensile to fit each use. Users like the uniform size and coiling characteristics of Samson Spring Wire.

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name your need . . .

- Upholstery spring wire, coiling and knotting quality
- Upholstery spring wire for marshall pack units
- Special upholstery spring wire for use in automatic coiling and knotting machines
- Common lacing wire
- Special automatic lacing wire
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These modern instruments have been in operational use for over two years and have been approved and accepted by the world's largest manufacturers of insulated wires.

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PLUG-IN ELECTRONIC DETECTION UNIT simplifies service and maintenance while obviating need for lost time.

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MONSANTO POLYETHYLENE formulations are based on long experience in supplying the specialized needs of the Wire and Cable Industry. That's why you can always count on a correct answer to your specific insulation problem, when you call Monsanto Chemical Company, Plastics Division, Springfield 2, Massachusetts.

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MPE 10 medium molecular weight natural, with non-discoloring antioxidant; primary insulation for telephone cable, power cable, control cable, and general insulation use.

11302 medium molecular weight black, with non-discoloring antioxidant; for line and drop wire insulation, weather-resistant primary and support wire insulation, general purpose jacketing.

12203 high molecular weight natural, with non-discoloring antioxidant; primary insulation for telephone, power, and control cable; insulation requiring superior toughness, maximum stress crack resistance.

12253 medium molecular weight natural, with non-discoloring antioxidant; for primary insulation for coaxial cable, power cable, telephone cable, and general insulation use.

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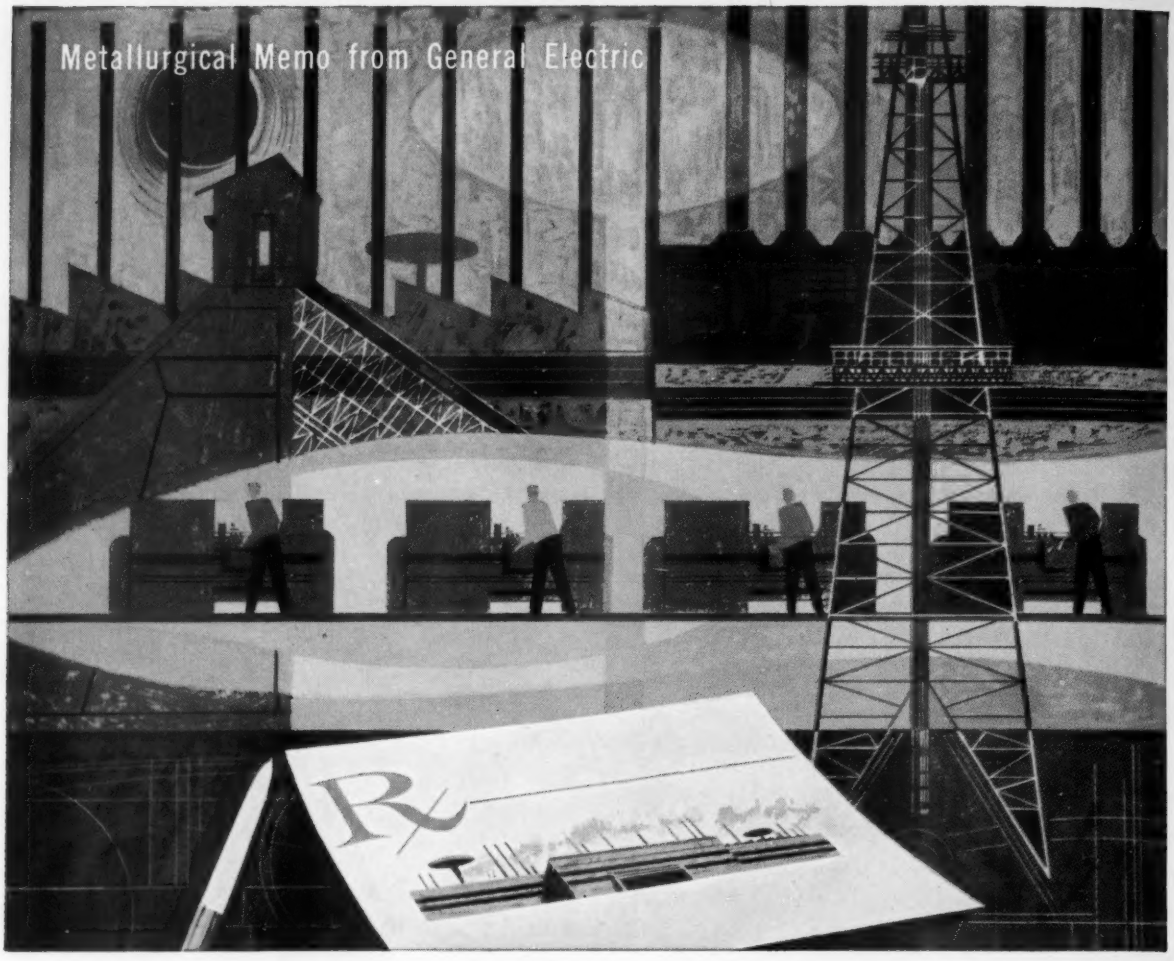

Why Industry's "metallic vitamins" now serve you better than ever

Metallurgical Products Department reports on Carboloy® cemented carbides . . . and on the new Authorized Carboloy Die Distributor set-up that gives you faster die delivery and service

The very introduction of Carboloy cemented carbides—up to 50 times longer wearing than steel—reacted like a vitamin on wire production. Carboloy cemented carbide dies have become an industry standard—have helped pave the way for improved wire products.

Now, another forward step has been taken. Carboloy dies are now available in all major die centers from Authorized Carboloy Die Distributors. This progressive step in distribution lets you get *immediate delivery* from complete die stocks carried by each distributor; and he'll give you fast die fabrication and refinishing service, too.

Next time you need dies, it will pay you to call one of the following Authorized Carboloy Die Distributors: Glen Carbide, Pittsburgh 19, Pa.; Allied Carbide, Jamaica 18, N. Y.; Bronson & Bratton, Chicago 32, Ill. Or write: *Metallurgical Products Department of General Electric Company, 11171 E. 8 Mile Street, Detroit 32, Michigan.*

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Continuous Cold Drawing Machines
for Precision-drawn Ferrous and Non-ferrous Bars, Rods, and Tubes
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1. TURNTABLES COMPLETELY ENCLOSED.
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8. INDIVIDUAL MAINTENANCE ON EACH SECTION.

The drum packaging Take-Up System illustrated, Model S5-TC-S, was designed especially for Magnet Wire.

Other models are made for all types of ferrous and non-ferrous wires.

Advanced engineering and precision construction have evolved in this machine new concepts of speed and efficiency in the packaging of wire. Capacity: Min. size — #32 ga.; max. size — #20 ga. wire.

YOU ARE INVITED TO SECURE COMPLETE DETAILS REGARDING THIS ADVANCED PROCESS FROM —

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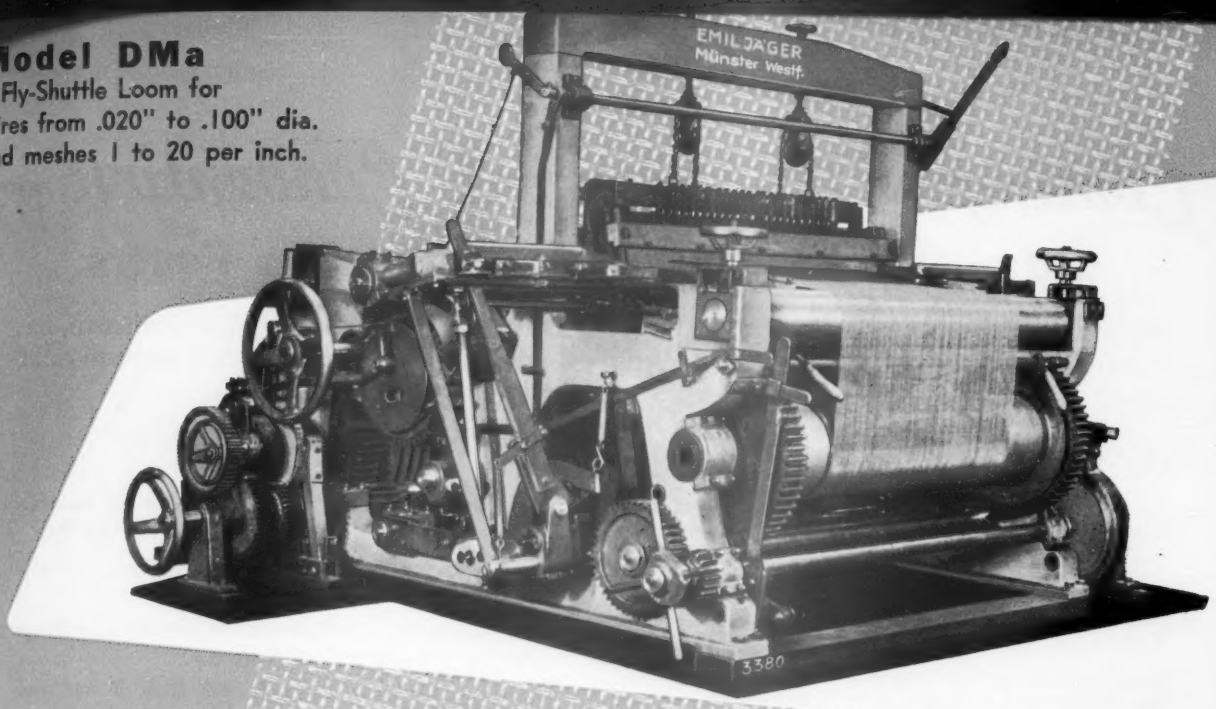
Model DMa
a Fly-Shuttle Loom for
wires from .020" to .100" dia.
and meshes 1 to 20 per inch.



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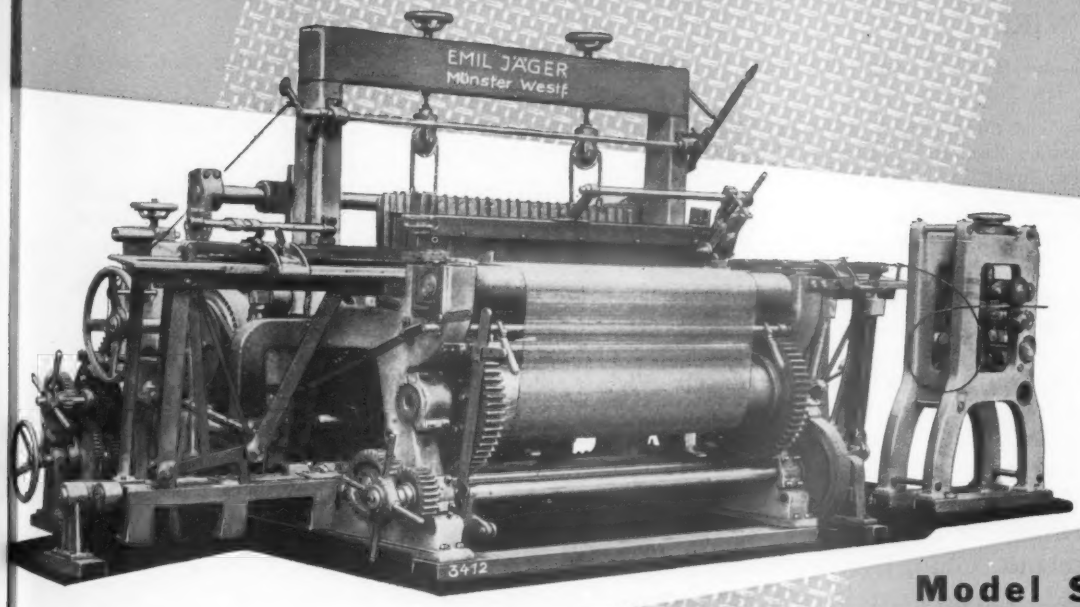
Wire Weaving Looms—Weaving width 40 to 80 inches



Model St-DMa
with Positive Pick-Arm Device
and synchronized Crimping Machine to
feed pre-crimped shoot wire direct from
crimper automatically into the shed of the loom
For high tensile wires from .020" to .100" diameter

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Coming—The Annual Convention—

with a Fine Program of Non-Ferrous Papers.

Dave Schmid, president of Techalloy Company, your Non-Ferrous Program Chairman, has secured with the help of his committee the following papers—with a few more to come later:

ON INSULATED WIRE

Facilities for Wire Irradiation with an Electron Beam Generator—R. P. Skundberg, General Electric Co., Milwaukee, Wisc.

The Use of Irathene Irradiated Polyethylene in Wire and Cable—A. M. Towne, General Electric Co., Schenectady, N. Y.

Thin Metal Strips for Sheathing Telephone Communication Wires—H. N. Padowicz, Western Electric Co., Kearny, N. J.

Bonding Characteristics of Insulating Varnishes and Wire Enamel Systems—D. L. McClenahan, Schenectady Varnish Co., Schenectady, N. Y.

Chemically Cross Linked Polyethylene, M. M. Suba, Union Carbide Plastics Co., New York, N. Y.

Production and Laboratory Control of High Quality PVC Compounds for Wire and Cable Insulations and Jackets—Q. R. Ball, Northern Electric Co., Lachine, Canada.

Small Diameter Power and Control Cables — Maurice Gilbert, du Pont Co., Wilmington, Del.

Gang Construction Plastic Insulated Wire, Three Different Colors Extruded Simultaneously.

Boron and Phosphor Polymers for High Temperature Insulations.

Oven Aging of PVC—by S. Greene, Apex Tire & Rubber Co., Pawtucket, R. I.

Recovery of Copper and Lead from Super Insulated Wire —Electric Wire Co.

Refrigeration Cooling for Plastic Insulated Wire—Acme Industries, Jackson, Mich.

ON BARE WIRE

Copper's Future—by R. P. Koenig, President, Cerro de Pasco Corp., New York.

Trends in Copper and Copper Alloy Rod and Wire—by Richard T. Christine, Technical Supervisor, Torrington Division, American Brass Co.

Recent Developments in Aluminum Alloy Wire—by Carl L. Kessler, Chief Metallurgist, Aluminum Co. of America, Massena, N. Y.

Titanium Zirconium Wire Drawing—by Johnston and Funk, Wooster, Ohio.

Panel Discussion on High Temperature Alloys for Springs —H. P. Smith, Associated Spring Corp., Bristol, Conn.

Some Metallurgical Factors in the Production of Fine Wire, Battelle Memorial Institute, Columbus, Ohio—C. M. Jackson, J. G. Dunleavy and A. M. Hall.

Impact of Modernization in Wire Weaving—T. L. Stilwell Warner-Swasey Co., Cleveland, Ohio.

Rhenium Wire Drawing — Bruce W. Gonser, Battelle Memorial Institute.

New Testing Concepts, Strain in Wires in the Elastic and Plastic Ranges by the Color Technique—Budd-Tatnall Measuring Systems, Dr. Zandman.

Glass Sealing Wires—E. G. Slick, Division Metallurgist, Sylvania Electric Products, Inc., Warren, Pa.

A Substitute for Silicon Bronze—Its Fabrication and Properties—Clyde V. McKay, Triangle Conduit & Cable Co., New Brunswick, N. J.

Vacuum Annealing of Wire — Ofenbau Fritz, Hagen, Germany.

This preview of the Non-Ferrous Program, which will be held at the Statler Hilton Hotel, Cleveland, Ohio, October 12-15, 1959, is an indication of the types of subjects to be covered. Further details will be presented as information is received.

All papers relating to Electric Wire and Cable are prepared for the production man in the mill to provide information of practical value.

THE WIRE ASSOCIATION

RICHARD E. BROWN, *Executive Secretary*

453 MAIN STREET • STAMFORD, CONN.

Ferrous Program

THE ANNUAL CONVENTION OF THE WIRE ASSOCIATION

October 12-15, 1959, Statler-Hilton Hotel, Cleveland, Ohio

2 P.M. MONDAY, OCTOBER 12

Mordica Memorial Lecture by John Rigby, John Rigby & Sons Ltd., England
Symposium on Wire Fabrication
Fabrication of Refrigerator Baskets
Mackinac Bridge Movie

9 A.M. TUESDAY, OCTOBER 13

A New Method for Fatigue Tests on Steel Wires and Wire Ropes
Air Force Tow Members
High Temperature Tests of Control Members
New Product Development in the Steel Industry

2 P.M. TUESDAY, OCTOBER 13

High Speed Steel Wire Drawing
Long Production Run Wire Coils
Use of Wire in Cold and Hot Forging
The Rolling of Round Wire into Flats and Rectangles

9 A.M. WEDNESDAY, OCTOBER 14

Basic Oxygen Steel for Wire Products
The Cuyahoga Rod Mill
Work Sampling in the Nail Mill
Quality Control in an Alloy Steel Bar Mill

9 A.M. THURSDAY, OCTOBER 15

Plant inspection tour of the Cuyahoga Works of American Steel and Wire.

In addition to the above, the Annual Dinner will be held on the evening of October 14, at which time the gathering will be addressed by Dr. Jason J. Nassau, professor and head of the Department of Astronomy, Case Institute of Technology. He is an outstanding authority on astronomy and will discuss this subject in relation to the missile program and space travel.

MAKE YOUR PLANS NOW TO BE PRESENT

A FULL PROGRAM OF PAPERS ON NON-FERROUS WIRE AND ELECTRIC WIRE AND CABLE WILL ALSO BE PRESENTED. ALL WIRE MEN ARE WELCOME.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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COULTER & McKENZIE

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WIRE DRAWING & PACKAGING MACHINE

PRECISION BUILT CUSTOM ENGINEERED

SUPER FAST BLOCK CHANGES — Push-button control interchanges 3 standard size draw blocks in seconds with **no gear or belt changes.** (8″, 10″ and 12″ blocks)

EXTRA VERSATILE PACKAGING — Accommodates coils, stems, and Draw-Pak containers. (20″ x 30″ or 23″ x 30″ drum)

MODEL NO. 116-B

IMPROVED DESIGN FEATURES:

1. Positive tangle switch
2. Fully enclosed
3. Liquid cooled
4. All steel welded construction
5. Electric clutch for "Soft Starting"

GREATER PRODUCTION CAPACITY

1. Continuous drawing and packaging of ferrous or non-ferrous wires.
2. Wire sizes to .100″
3. Number of reductions — 3 to 12
4. Speeds to 1000 ft./min.

For information concerning your application, please write or telephone.

Model 116-B will be custom engineered to your partic

This equipment manufactured under one of the following U. S. Patents 2,732,060; 2,868,474; 2,844,416; 2,868,268 or others pending.

Barron & Crowther Ltd., Eastleigh, England. European Draw-Pak Licensee. Idos Industries Ltd., Royston, England. Sales Agents.

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SINCE 1843 BRIDGEPORT 7, CONNECTICUT, U.S.A. INCORPORATED

The Wire Outlook

This month we present some of the views of a widely traveled student of world economics, a du Pont vice-president, director and adviser on research, Samuel Lenher.

He believes that we have no monopoly on science and in support of this points out that scientific achievement is moving ahead rapidly in many foreign countries. He is a "protectionist" to the extent that he feels that we should have duties that will equalize foreign wage scales and maintain an umbrella over American workers in industries where foreign products are made under conditions that are depressingly low. Neither "free traders" nor "isolationists" have much logic in their reasoning. Free trade, he points out, should not be one-sided. While our country is taking definite steps in this direction, many foreign countries are building shut-out tariff barriers. As an example, a Ford car now costs about $6000 in France, $8000 in Brazil, and $16,000 in Argentina.

The inescapable fact is that many manufacturers abroad can produce products at lower prices than we can match, the big difference being the wages paid to make them. These will be one-fifth to one-seventh of what our workers are paid. Did we live in a perfect world in which all wages and standards of living were comparable, and in which everybody could be trusted to live up to their bargains, free-trade would be quite logical and right. That in which we are in need is protection of the position of American science and technology, which, under present theories, may be strangled slowly. There should be no measures taken to protect businesses that cannot meet competition because of inefficiency.

In all of this the American workman stands to lose as much as anyone, since foreign wage scales would hardly be acceptable to our workers here and if industries are put out of business by low priced imports, jobs are destroyed.

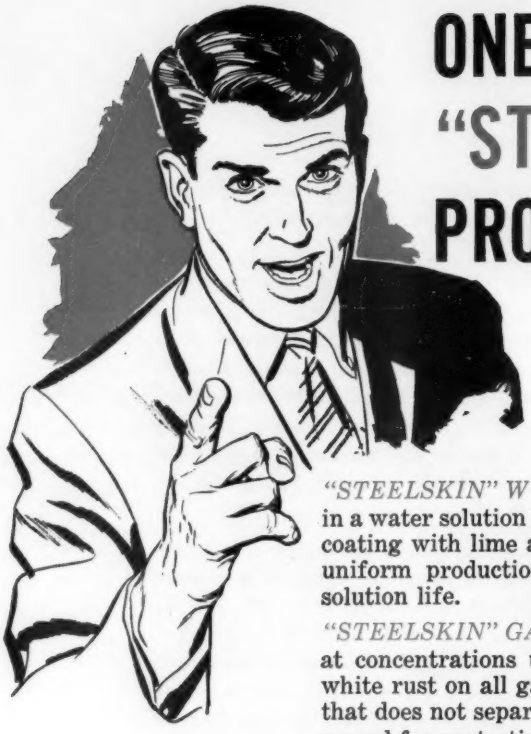
For many years this country had no real competition, but with foreign business getting bigger and with many of their technologists just as able as our own, we are now feeling the effects of this new era in foreign productivity. Mr. Lenher pointed out to our Senators and Representatives a few years ago that it was not our supremacy in science that enabled us to meet war needs, but the nation's protective tariff system, which gave American industry an equalizer against the onslaught of low-wage European imports. It enabled us to develop our technology in the field and, in so doing, helped to build industries that are indispensable to defense and to a prosperous peacetime economy.

The United States has, he states, a definite stake in the development of the free nations of the world, but at the same time our allies have a definite stake in the strength of this nation. The problem is to find an economic formula that promotes the growth of our allies without jeopardizing the strength of the United States of America.

A solid tariff wall, prohibiting all imports to this country, must be dismissed immediately as an impossible solution. We are the world's largest importer, our markets are important to friendly nations, and some of our imports are vital to defense.

With Mr. Lenher's several comments we are in hearty accord. Extremes will not work. Our lawmakers and our State Department might well subscribe to rules of reason instead of the theory that our resources of materials and technology are superior and inexhaustable.

Edmund Duval Sickels
EDITOR



ONE OF THESE "STEELSKIN" PRODUCTS MIGHT SOLVE *YOUR* PROBLEM!

"STEELSKIN" W Coating Compound — a borax-base coating, used in a water solution for low and high carbon steel, eliminates need for coating with lime after pickling, results in increased die life, more uniform production, better drainage and protection with longer solution life.

"STEELSKIN" GALVASEAL ASP Wax Coating Compound — used at concentrations up to 5% provides excellent protection against white rust on all galvanized surfaces. ASP offers a stable emulsion that does not separate; has received wide acceptance where there is a need for protective coating under adverse conditions.

"STEELSKIN" 3167 Drawing Oil — is water-emulsifiable and is being used at various concentrations for the wet drawing of copper-coated wire, galvanized spring wire, stapling wire, and on weaving machines. "STEELSKIN" 3167 gives longer solution life . . . better lubricating properties.

"STEELSKIN" C Coating Compound — a dip solution used before lime coating on all types of stainless steel wire, provides more uniform lime coats; makes possible heavier lime coats, greater reduction in each wire drawing operation, increased die life, and a more uniform finish on the wire.

"STEELSKIN" GALVASEAL B Paste Compound (also furnished in liquid form) — used as a hot-water-solution dip. The film imparted on the wire does not readily re-dissolve and protects the zinc coating from the deteriorating effects of white rust during storage or transit. It also aids the nesting of strands, produces smaller bundles, and provides lubrication for subsequent operations.

"STEELSKIN" 1069 Wax Oil Compound — for drawing bare, uncoated stainless steel wire through one hole to produce a bright finish.

These are just a sampling of many "STEELSKIN" products designed for specific jobs in wire drawing. We welcome the opportunity to recommend specific "STEELSKIN" products to fit your requirements. Write today. We'll give your request our immediate attention.

R. H. MILLER CO. INC. 1909-1959 50th ANNIVERSARY Homer, N.Y. Steelskin Lubricants

Steelskin REG. U.S. TRADE MARK

R. H. MILLER

COMPANY, INC., Homer, N. Y.

METAL WORKING LUBRICANTS

WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 34 AUGUST, 1959 No. 8

In-Line Processing of Rod to Wire For Cold Heading

by R. C. Rhoades
Works Manager
Kansas City Works, Sheffield Division
Armco Steel Corporation
Kansas City, Missouri

This paper was presented at the Regional Meeting of The Wire Association held in Houston, Texas, on May 7 and 8, 1959.

About three years ago, in connection with the projected transfer of our bolt plant operations to new facilities, we decided to investigate the possibility of mechanically descaling rods in preference to construction of traditional pickling facilities.

★ ★ ★

Since that time, we have undertaken rather extensive experimental work aimed at the development of an economically sound method for the in-line processing of hot rolled rods to cold header wire. We have been assisted in this endeavor primarily by the **Wheelabrator Corporation** and the **Parker Rust-Proof Company.**

★ ★ ★

To date we have had a fair degree of success. We have set up two primary rod processing lines. One has been in operation almost two years, and handles rods from ¼" diameter to 39/64" diameter, at processing speeds of from 180 to 300 feet per minute. The second line has just been completed and will handle sizes up to 45/64". Processing speeds are from 300 to 600 feet per minute. These two lines are adjacent to each other and, where practicable, are served by common supporting facilities.

★ ★ ★

Additionally, a third line has been set up to provide for direct in-line processing of rods feeding to a ¾" Boltmaker. This unit has been in operation about six months.

★ ★ ★

The sequence of operations in our two primary lines is as follows:

1. Receipt and storage of hot rolled rod coils
2. Placement of rod coils on a turn-around flipper rack
3. Butt welding of coils
4. Straightening
5. Shot blast descaling
6. Chemical rinse
7. Phosphate coating
8. Neutralizing and drying
9. Wire drawing
10. Wire recoiling and storage on high-hat reels

★ ★ ★

Steps 2 through 10 constitute a continuous, straight-line process. The schematic drawing (Fig. 1) assists in visualizing the overall sequence. These steps will now be discussed in detail.

Receipt and Storage of Coiled Rods

Our Rolling Mills are approximately one mile from the bolt plant. Accordingly, the rod coils are placed in a bolster at the mill for subsequent transfer by straddle carrier to the bolt plant's rod storage area. Upon arrival, the straddle carrier drops the loaded bolster and returns an empty one to the mill for reloading.

★ ★ ★

At the bolt plant, the rod coils are removed from the bolster by a gasoline-driven boom lift truck and placed in open storage bays designed to hold approximately 200,000 pounds each.

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When needed, the rods are removed from storage by the boom truck and placed on the plant dock. The rods are then transferred from the dock to the processing line by an inside electric-powered boom truck.

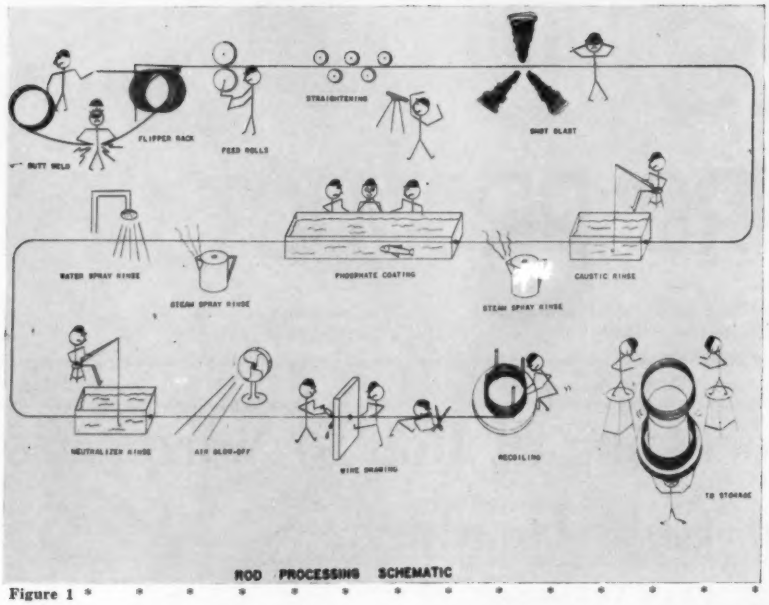

Figure 1

Turn-Around Flipper Rack

This rack is designed so that an overhead hoist can load three or four coils on one end while the other end pays off rods to the processing line. The ends of adjacent coils on the rack are butt welded together, and the last coil on one end is welded to the first coil on the other end. The rack is rotated when the last coil has payed off the end, and continuous feeding is thereby provided.

Butt Welding of Coil Ends

The welder is a 5/8" capacity Micro butt welder and is calibrated for simple and fast operator adjustments as necessary to compensate for different sizes and grades of rods. It is equipped with an induction heating station for annealing the weld area of high carbon rods.

★ ★ ★

The coil ends are sheared before welding by a portable Manco guillotine shear to provide a clean surface for welding.

★ ★ ★

After welding, the flash is trimmed and the weld smoothed by air-operated chipping and grinding tools.

★ ★ ★

We will shortly be receiving all our rod coils from our new 23-strand high-speed rod mill. These coils will weigh approximately 1,000 pounds each, for sizes through 21/32", and 1,800 pounds for the larger rod sizes.

★ ★ ★

The coil sizes, when handled on our new line at estimated processing speeds of from 300 to 600 feet per minute, will yield processing times for one coil varying from slightly over three minutes to a maximum of thirteen minutes depending on the rod diameter. In this time, the welder must place a new coil on the flipper rack and weld it to the adjacent coil in order to maintain the cycle.

★ ★ ★

Safety stop buttons have been placed on the unit to stop the line whenever the welder gets behind, a weld breaks, or a tangle develops.

Straightening

From the pay-off rack, the rod goes through a guide to a set of feed rolls. These rolls are used only in the initial stringing of the unit. The bull block or dead block pulls the wire once the unit is in operation. It should be mentioned that size changes are made by welding the new size rod onto the last coil of the preceding size. (See Fig. 2)

★ ★ ★

The rod must be straight when entering the abrasive shot blasting unit to insure that it remains within the abrasive shot blasting pattern. Straightening rolls are, therefore, set up on both the vertical and horizontal plane. These rolls also serve as preliminary scale breakers as a result of the bending pressure they apply.

Figure 2

★ ★ ★

The straightening rolls are readily changed as necessary to accommodate the different rod sizes.

Abrasive Shot Blast Descaling

The abrasive shot blasting unit was designed and supplied by the Wheelabrator Corporation, Mishawaka, Indiana.

★ ★ ★

The rod is cleaned by steel abrasive particles propelled by three centrifugal blasting wheels, located on 120-degree increments around the horizontal pass line center.

★ ★ ★

We have been experimenting with different types of abrasives and have been most successful to date with fully hardened steel abrasive shot or grit, approximately .017" initial size.

★ ★ ★

The abrasive is recovered and recirculated by a recirculating system which separates the scale and fines of a minimum diameter of .004" or less by an air-wash separator. The replacement of this worn-down abrasive represents the hourly abrasive consumption. The air-wash separator operates in conjunction with the negative pressure ventilating system and dust collector unit to insure a dust-free operation.

★ ★ ★

The abrasive shot blast pattern will clean the rod satisfactorily at

speeds up to 200 feet per minute. If higher speeds are desired, the rod must make more than one pass through the shot blasting unit. We have provided for this by the use of turn-around sheaves mounted on the outside of the unit to provide for two return passes through the unit. In this manner, we can make up to three passes through the unit and attain descaling speeds approaching 600 feet per minute.

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From the Wheelabrator unit, the descaled rod feeds into our coating line. This line was supplied and designed by the Parker Rust-Proof Company, Detroit, Michigan. The photograph and schematic drawing will perhaps assist in visualizing the successive stages of this portion of our line. (See Figs. 3 and 4)

Chemical Rinse

To remove the fine dust or smut that remains on the rod after abrasive cleaning, it is passed through a heated bath (200° F.) of a basically caustic chemical solution. For this purpose, we use Parco Cleaner No. 352 which not only removes the dirt but helps activate the surface to allow faster phosphate coating.

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The rod is then passed through a steam spray rinse to remove the caustic solution before coating. Moreover, since phosphate coating can be best applied at a temperature of about 200 degrees, the steam rinse is further beneficial in that it helps raise the rod temperature prior to application of the coating.

Phosphate Coating

The coating solution used is Stran Bonderite 10X. This is a dilute zinc acid phosphate solution which reacts chemically with the surface of the rod to form an insoluble non-metallic crystaline phosphate coating, integral with the surface of the metal.

★ ★ ★

This coating provides a porous bond to carry the extruding and heading lubricant. Although it may be greatly elongated during the drawing process, a sufficient quantity will remain to prevent metal-to-metal contact in the subsequent cold heading die. This, of course, prolongs tool life, permits heavier extrusion, and improves the surface appearance of the finished product.

★ ★ ★

The effectiveness of the coating is dependent on such factors as its thickness, crystaline structure, and the extent of penetration into base metal. These characteristics are in turn affected primarily by the adequacy of the cleaning method, duration of time that the rod is exposed to the coating bath, and chemical composition of the bath itself. The Bonderite composition is formulated to minimize coating buildup in the event of intermittent shutdowns.

★ ★ ★

The Bonderite solution developed requires immersion of ten to fifteen seconds to get the desired coating. To expose the rod to the solution for this period of time and still maintain the desired travel speed of 150 to 180 feet per minute in our initial unit, its coating tank was made 46 feet long. With this unit, we have consistently applied coatings of better than 750 mg. per square foot of rod surface area.

★ ★ ★

The coating tank on our new line is made of two parallel stainless steel tubes 47 feet long. They are connected with turn-around sheaves at the ends rigged so that the rod can pass up one tube, down the other, and back up the first for an effective immersion of approximately 150 linear feet. This will provide adequate immersion time for larger rods requiring heavier coatings while still maintaining processing speeds of up to 600 feet per minute. The tubes are fitted with overflow dams at each end to maintain the solution level above the pass line of the rod.

★ ★ ★

The Bonderite supply is stored in a central tank constructed of stainless steel. It is equipped with stainless steel plate coils for the circulation of steam as necessary to control the bath temperature at approximately 200° F. The solution is recirculated to the coating tanks by a centrifugal pump. Sludge, which is a natural by-product of phosphate coating is precipitated out of the bottom of the supply tank and transferred by a sludge pump to a settling tank. Here the clear liquor is drained off and returned to the supply tank, and the sludge is dumped.

★ ★ ★

On leaving the coating bath, the rod is passed through a steam and cold water spray rinse to remove the excess solution.

(*Please turn to page* 1016)

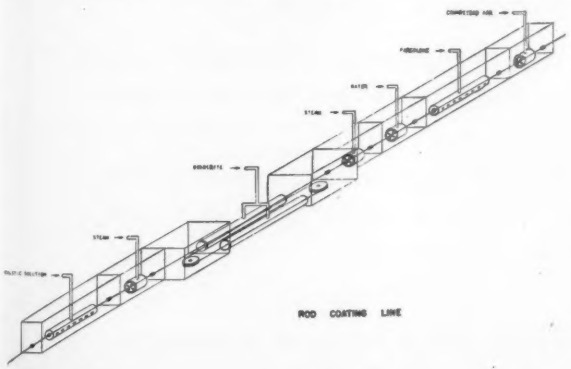


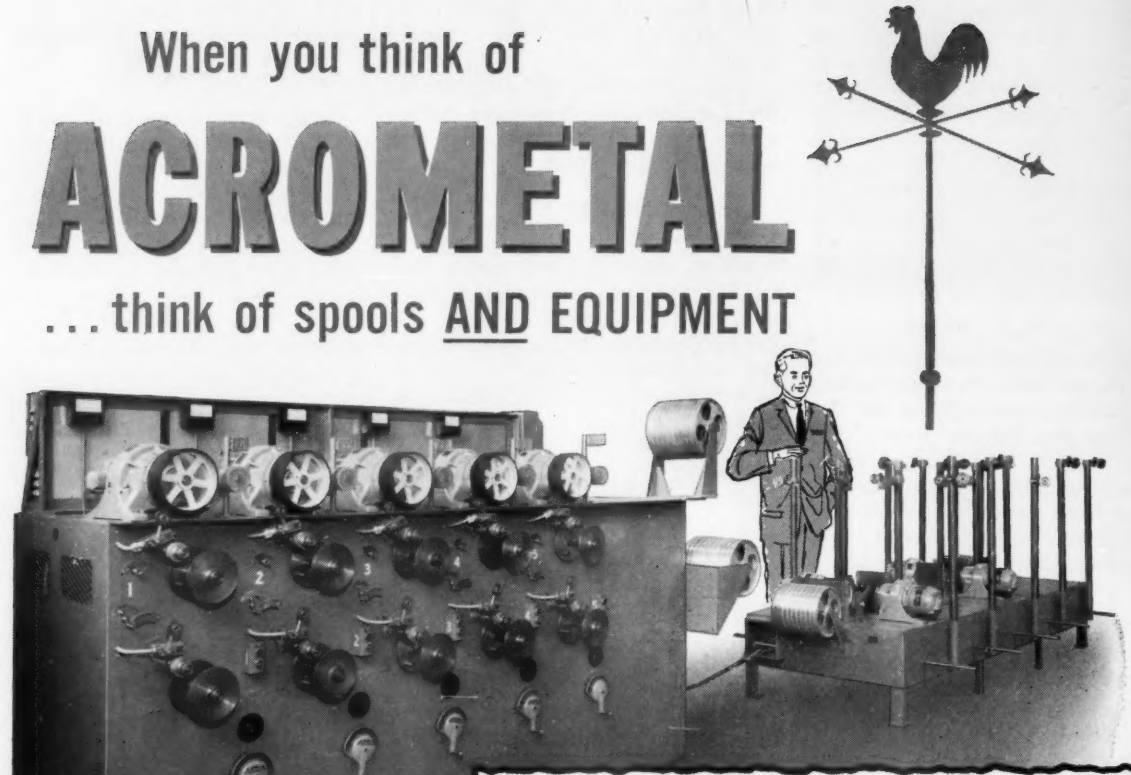
Figure 3

Figure 4

When you think of

ACROMETAL

... think of spools AND EQUIPMENT



Today, we make a lot of things besides spools and reels.

Most of our special equipment for processing and packaging wire was designed because somebody came to us with a problem. Maybe our engineering and development men can help you, too.

HERE'S AN EXAMPLE
of some of the things we are doing

A big ten-head, custom-built electronically controlled machine to feed fine wire, at a controlled speed, through an annealing furnace. Power driven TAKE-UP and LET-OFF are synchronized to feed wire without stretch or tension.

This machine is a successful, major break-through in automating an exceptionally delicate operation.

It was developed at the request of a big producer to solve a special production problem.

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Designers and manufacturers of everything you need for packaging wire

Advanced Lubricants and Pressure Dies for Better Wire Drawing

by Earl A. Bowers, Jr.
Vice President
Standard Industrial Compounds Company
Frankfort, Illinois

A paper presented at the Regional Meeting of The Wire Association in Houston, Texas, on May 7 and 8, 1959.

The use of pressure dies is neither new or novel, but in our opinion, this approach to tighter tolerances, the utilization of high speed wire drawing equipment, and corresponding peak tonnages, has demonstrated the need for a complete evaluation.

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We do not assume the privilege of telling a Mill how to operate. As a matter of fact, a large percentage of our knowledge concerning the best results obtained from a lubricant, comes from the Mill itself. However, as certain patterns establish themselves, out of these, strong recommendations may be laid before the operating people.

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Our position, as one of the principal manufacturing companies of complex metallic, sodium and specialized soaps, was the formulation of a special group of lubricants readily adaptable to specific finishes plus the new high speed methods of producing wire.

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In approaching the problem of developing lubricants to withstand the impact of deformation at accelerated speeds, a new series of formulations have been developed.

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It has been established that pressures up to 300,000 psi are not uncommon, and surface temperatures of up to 550 degrees F., when leaving the die, with peak temperatures up to 1800 degrees F. within the die lasting one-thousandth of a second, are attained.

★ ★ ★

All soaps contain a positive and a negative radical. The negative part of the soap is the fat, the positive part is the metal or metals with which the fat is combined.

★ ★ ★

Extreme pressure lubricants, as we have termed them, are composed of additives, chemically combined with the positive and negative radicals. These additives react with the metal surface under extreme conditions to form an inorganic layer on the surface of the wire. These layers withstand temperatures and pressures beyond the capabilities of conventional lubricants.

★ ★ ★

It has long been our opinion that the basic problem in maintaining closer tolerances at greater drawing speeds, and a corresponding high W E yield, is a **lack** of a **continuous, uniform** film of lubricant. Many every day mill problems contribute to this lack of continuous film — such as — a fresh borax solution, loose or irregular lime coating, faulty rinsing and even in some cases — poor cleaning.

★ ★ ★

We feel that the ideal condition is a tube of lubricant enveloping a core of metal.

★ ★ ★

My experience with pressure dies dates back to 1949 when my old friend, **Curtis Voigtlander,** of Union Wire Rope, permitted us to work on pressure dies. At that time, our experimental work revolved around drawing a higher specification Improved Plow Rope Wire. While the use of the pressure die indicated a value, the tempo of the wire industry, during those years, was so tremendous that the further exploration was shelved for the moment.

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Several years later, with the introduction of the new high speed drawing equipment, and the need for wire with physicals beyond the general range, it became a natural to couple extreme pressure lubricants and pressure dies together.

★ ★ ★

The pressure die in itself presented problems of design and methods of holding whereby it could be used simply. The pressure die we work with is made from used dies, generally slotted or drilled thru the casing at points found to be best for a specific mills operation.

★ ★ ★

Our initial objective was the drawing of Big Head Roofing Nails, not a difficult drawing operation, but one wherein the coating on the wire is critical. A 7/32 rod was pickled and single dipped in heavy lime and baked. A simple two slot design pressure die, of variable width, depth and opening, was used in conjunction with the ripper die only. This particular operation was four hole .121 on old hot equipment, with a finishing speed of 1100 F.P.M.

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The lubricant used was a conventional synthetic sull type, which was fortunate as the uniformity of coating was more readily discernible. After several bundles were run on this set of machines and tagged as to the specification of the pressure die thru which they were run, this wire was taken to the Nail Mill. On certain bundles the results were of immediate interest, as the

(*Please turn to page* 1021)

The Production of Stainless Steel Wire

by Gilbert C. Klingel
Mill Representative
Baltimore Works
Armco Steel Corporation
Baltimore, Maryland

This paper was presented by the author at the Regional Meeting of The Wire Association held in Houston, Texas, on May 7-8, 1959.

The operation of a fully integrated stainless steel wire mill today is a complex process; and as the years have passed, the complexity has increased, and the number of problems has multiplied. This multiplication is traceable to several trends, chief of which are: (1) The increase during the last twenty years in the variety of special steels for special or unusual purposes, and (2) The tendency for wire customers continually to narrow their stainless specifications and requirements with respect to finish, tolerances, and other properties. Because of its amazing variety of special uses, stainless steel wire must now conform to a large series of standards which formerly were not of particular importance. To illustrate, the large stainless wire mill today may daily process up to forty regular stainless grades or analyses and well over a hundred extra or special compositions at less frequent intervals. Practically every stainless wire order will require some modification in size, finish, heat treatment, mechanical properties, coating, or type of processing. Few single wire orders, even in the largest mills, are of large tonnage, or large enough to create a continuous or fixed type of operation, although the total tonnage may be appreciable. Thus, while the production of stainless steel wire follows basic practices common to most wire mills, there are, nevertheless, innumerable modifications in the daily mill routine for each specific order requirement. Further, because of the highly critical uses to which many of the stainless steels are now put, the criteria of quality, performance, and properties are of an exceedingly high order. The modern stainless steel wire mill, such as that of Armco's Baltimore Works, is, in effect, a large scale, highly specialized, job shop. There is no routine in the ordinary sense of the word.

Fig. 1—Temperature of stainless steel being measured at Armco's Baltimore Works with an immersion thermometer. * * * *

This accent upon quality and precision, and the need for properties in excess of those available in less costly material, is reflected throughout stainless production and begins, properly enough, in melting practice because it is there that the inherent quality of the wire is first controlled. At Armco, every stainless wire heat is tapped and poured under precise and measured limitations of temperature control, and active steps are taken to eliminate or prevent the occurrence of entrapped oxide scums. Quality control is also exercised early in the blooming and billet operations where, by suitable conditioning, the billet stock, before entering the rod mill, is ground all over to eliminate all hot rolling tears, slivers, check marks, or other surface defects. In stainless wire production, proper conditioning is essential because the surface of the hot rolled rod is a direct reflection of the cleanliness of the surface and sub-surface of the original billet. A fold or tear in a stainless billet, unremoved, will, after rolling, produce an incurable seam, elongated sliver, or other fault. One of the reasons for the relatively high cost of stainless steel wire is the necessity for expensive conditioning before rod rolling. Similarly, to prevent surface faults and other hot rolling defects, rigidly controlled heating cycles have been developed for each of the stainless grades. Most stainless rods are rolled at relatively high temperatures (in the order of 2000 to 2300°F) and soaking times before rolling are critical in some grades.

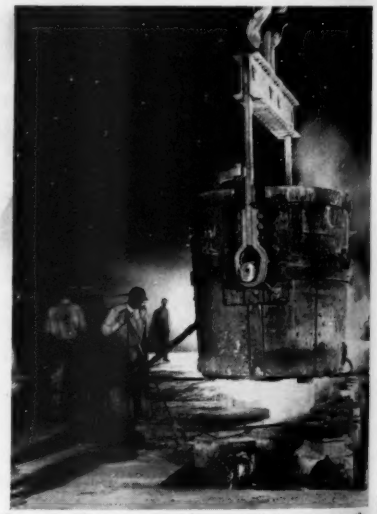

Fig. 2—Teeming stainless steel ingots at the Baltimore Works. * * * * *

Up to this point, most stainless steels are handled in the same general manner; but with the completion of the hot rolling, the divergence of practices begins.

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For convenience, the reader will recall that the stainless steels are divided into three general main groups:

1. **The so-called straight chromium martensitic stainless steels which are hardenable by heat treatment.**
2. **The straight chromium ferritic steels which are not.**
3. **The chromium-nickel stainless steels which can be hardened by cold work only.**

Added to these is another, intermediate group, the relatively new precipitation hardening stainless steels, typified by Armco's 17-7 PH and 17-4 PH, which contain both chromium and nickel, in addition to precipitation hardening elements, and which can be hardened by refrigeration or heat treatment as well as by cold work or combinations of these treatments.

★ ★ ★

Inevitably, such variety of hot

Fig. 3—Pickling and coating stainless steel wire.

rolled stock requires varied annealing practice. The hardenable grades after rod mill rolling and cooling are in a fully hardened condition and must be annealed at once or

Fig. 4—High pressure water spraying of stainless steel wire after removal from pickling tanks.

tempered or stress-relieved to prevent embrittlement from acid fumes or other embrittling agents. The other basic grades may be stored in the hot rolled condition, if desired, or may be annealed and stored for subsequent processing.

★ ★ ★

In general, the hardenable grades, with a few exceptions such as Types 414 and 431, are softened by heating in the range of 1500-1550°F and slowly cooling to about 1300°F, then air cooling to room temperature; the ferritic types by heating to about 1425-1450°F and water or air quenching. The chromium-nickel grades, however, are annealed at 1900-2100°F, depending upon the type, and quenched as rapidly as possible in water to eliminate the precipitation of harmful carbides in the grain boundaries. These generalities, however, are complicated by a variety of special technical or economical considerations. The extra low carbon austenitic steels (.03% maximum carbon), for example, in certain size ranges (less than ¼"), need not be annealed at all before cold drawing; this prevents carbon contamination from furnace atmospheres. Fortunately, these grades are fully soft off the hot mill, and carbide precipitation in them is not of consequence because of their inherent low carbon content. The free-machining grades, such as Types 303-S and 303-Se, because of their free-machining elements, are rather prone to excessive scaling in gas or oil-fired car type furnaces; and the furnace times and temperatures must be shortened and lowered to the minimum practical limits to preserve the original surface finish. Likewise, Armco's precipitation hardening alloy, 17-4 PH, is prepared for cold drawing by overaging at 1200°F for 4 hours, the metal's most ductile condition, rather than at the final "annealing" temperature of 1900°F, which is really a solution treatment prior to final aging. These considerations of economy, finish, properties, and subsequent processing all govern and complicate stainless heat treating practices as well as the choice of equipment for the particular job. Full-scale stainless wire production requires a variety of heat treating equipment ranging from ordinary oil or gas-fired car furnaces through a variety of strand furnaces, salt baths, and bright atmosphere furnaces.

★ ★ ★

Hot rolled and annealed stainless rod or annealed cold drawn wire possesses, ordinarily, an exceedingly tight scale. Its removal was a difficult commercial task until the introduction of the sodium-hydride descaling process. This softens the scale prior to subsequent immersion of the wire in hot solutions of sulfuric acid, followed by nitric-hydrofluoric and finally nitric acid to clean and brighten the surface. It consists of a brief (15 minute) dip in a molten (800°F) bath of caustic soda to which sodium hydride is added from generators in which hydrogen, from dissociated ammonia, is reacted with metallic sodium to produce the necessary sodium hydride. The process is adaptable to all grades except the 17-4 PH precipitation hardening alloy. Unfortunately, with it, the high bath temperature causes premature aging.

Fig. 5—Annealing stainless steel wire coils in molten salt greatly reduces scale formation.

The pickle house in an all stainless wire mill may contain, in addition to the usual pickling and cleaning line, and the usual lime tubs common to most wire mills, copper plating units, either chemical or electrolytic or both, a molten lead bath, and an oxide bath. Not the least of the problems in producing stainless wire or wire products is the inherent tendency of the material, particularly certain of the austenitic grades, to gall or seize in the die or in later cold heading or

during extrusion. For this reason, special precautions must be observed to eliminate bare spots, rough shoulders at the point, rough welds, foreign particles, residual scale, wet spots, and the like. For the same reason, stainless wire which is to be heavily drafted or put through multiple passes must use lead, copper, or an oxide coat. The common soap and lime is satisfactory for single pass drawing and produces better surface finishes than lead, but breaks down at the higher temperatures and pressures necessary to make heavy or multiple reductions. Ordinarily, copper is not used as a mill drawing coating but is applied only at the request of the purchaser as a lubricant for his cold forming operations. Lead has the disadvantage that wire smaller than .100″ round cannot be batch coated because the strands tend to bond together. Also, the lead coat shields the wire surface so that relatively little surface smoothing is accomplished. (Lead drawn wire must be stripped before annealing.) Oxide coating approaches lead in suitability for multiple or heavy passes but is most effective in sizes below .200″ round; it is of limited value in drawing shapes or hot rolled rod. It need not be removed before annealing. Some steels, notably Type 431, are embrittled by zinc, and it is important that cold drawing lead be free of this element.

★ ★ ★

Because of the inherent galling

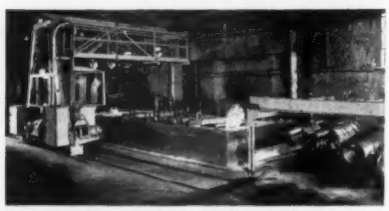

Fig. 6—Sodium hydride pickling tank for stainless steel wire. Molten caustic is fed with metallic sodium through cracked ammonia to produce the sodium hydride solution. * *

and lubrication problem, the drawing speeds of stainless wires are necessarily somewhat slower than for carbon steel wires. Stainless wire is ordinarily drawn at speeds of only 200 to 300 feet per minute, depending, of course, on the hardness, diameter, and ductility of the grade involved, although, at times, higher speeds are achieved. Also, because of the abrasive nature of these inherently tough steels, tungsten carbide dies are customary for sizes down to about .030″; below this, diamond dies are usually used. Die life is relatively short, particularly with the high carbon stainless steels and some other hard and refractory grades.

★ ★ ★

Because the stainless steels are

Fig. 7—Strand annealing furnace capable of annealing wire from 10 coils at one time. *

so often purchased for their decorative appeal, or for such applications as medical, food processing, or sanitary equipment, or for springs where surface perfection combined with corrosion resistance is of importance, and also because the stainless steels are often viewed as expensive materials, as indeed they are, surface perfection and high lustre is usually expected. The achievement of consistent bright, shiny surfaces is one of the most difficult of problems in stainless wire manufacture and has never been fully solved by any of the stainless wire mills, although progress is steadily being made in this direction. Ordinary lime and soap cold drawing does not provide a bright surface, even after cleaning, nor does lead or copper offer advantages. The maximum smoothness and lustre on cold drawn wire is obtained by drawing uncoated, annealed and pickled wire through grease lubricants. The poor lubricating properties of grease limits its use to single pass reduction not exceeding 20% on austenitic grades and 30% with the straight chromium grades, usually somewhat less. Innumerable proprietary lubricants have been concocted to help solve this problem but few offer much real promise. Much experimental work has been done to smooth stainless wire chemically before the final draft* to give extra lustre; but when too-slick wires are introduced into the die, they gall and scratch because the lubricant will not carry into the die. Such smooth wire, paradoxically, must be pickled to roughen its surface slightly before it can be drawn at reasonable speeds. Work has been done, also, to skin or shave stainless wire mechanically to improve lustre, but this approach is expensive and not wholly successful. The basic cause of this problem lies in the fact that stainless defects left over from prior processing do not readily "iron out" with continued drawing but tend merely to elongate. This is one of the reasons why such close attention is given to quality and to conditioning as far back as the billet stage. Appearance, as well as tolerance, is one of the reasons why a substantial percentage of stainless steel wire is sold in the centerless ground condition, and the stainless wire mill requires as a basic part of its equipment a substantial battery of centerless grinding machines. Many fabricators depend upon electropolishing or buffing to provide the sparkle to their fabricated products, and the production of wire for electropolishing is one of the stainless wire mill's more difficult tasks, particularly in the larger sizes above about .150″.

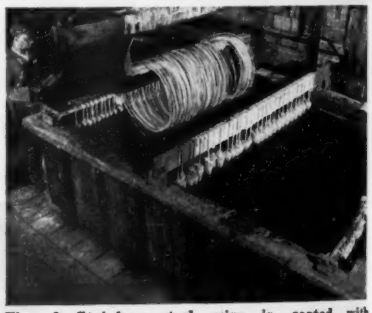

Fig. 8—Stainless steel wire is coated with copper by electrolisis. Coils are then quenched in water to remove excess cyanide acid. The solution in this copper unit contains sodium and copper cyanide. Temperature: 90° to 100°F.

Other difficult tasks imposed upon the stainless wire mill is the requirement for fulfilling specifications to very narrow limits of hardness or tensile properties. For example, in recent years, certain groups of manufacturers have discovered that they can couple highly desirable mechanical properties with optimum machining ranges for certain automatic machine setups by specifying Types 410 and 416 to a relatively high, eight point

* U.S. Patent No. 2,694,601.

(Rockwell C26-32) hardness range. Few realize the hardship this imposes on the wire maker or the valiant efforts he must make to overcome costly "remakes." Such wire must be hardened and then tempered in commercial sized furnaces to a plus or minus 10°F average temperature level predetermined according to the carbon, chromium, nickel, and molybdenum content of each heat. If the wire drawer had only to aim for the hardness level of the wire as it emerges from the furnace, the matter would be relatively simple; but he must also calculate exactly the amount of hardness increase which occurs on cold drawing and then the probable drop after straightening. The marvel is not that there are occasional remakes, but that there are so few of them. There is more of this sort of thing in prospect for the stainless manufacturer, but in compensation is an increasing skill in meeting such rigid limitations and an increased metallurgical know-how.

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In the opposite direction is the

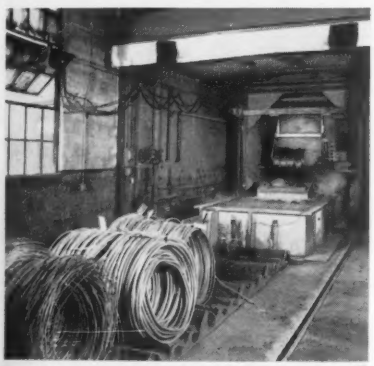

Fig. 9—Lead coating coils of stainless steel wire that will be cold drawn two or more passes in a continuous operation. This coating "holds up" on the wire, giving it the lubrication required when going through the die. * *

pressure of the cold heading customers to provide ever softer and more ductile wires for difficult forming operations in a series of alloys which are inherently tough and resistant to easy deformation. To meet this need, improved compositions and techniques are coming out of the research laboratories. Stainless wires, particularly certain of the austenitic types, have a high work hardening rate; and while this may be controlled to some degree by composition (particularly carbon, nickel, and nitrogen), it is often necessary for the wire drawer to resort to unusual practices to produce a stock that has maximum softness and optimum large grain size. In the same vein, recent Armco research* has shown that the cold work hardening rate of the chromium-nickel steels may be appreciably lowered by warming cold heading wire at any temperature up to 400°F before deformation, and a few progressive cold heading firms have begun to make commercial use of this information.

Fig. 10—Single pass wire drawing block. * *

Some stainless grades, such as Type 440C and Type 446, pose special problems for the wire drawer in addition to the regular ordinary difficulties. Type 440-C, a martensitic high carbon (1%) straight chromium grade used for its high hardness and abrasion resistance, can be exceedingly brittle while under tension in the draw bench and, while possessing good inherent ductility, often fractures badly between the die and the block. For many years, this problem baffled stainless producers and all sorts of metallurgical subterfuges were tried to alleviate the condition. At times, it became so severe that a single coil would become a useless collection of broken strands. Not until recognition was made that the metal was extremely notch-sensitive under the extreme loads of cold drawing was the problem solved. Transverse scratches so fine as to be barely discernible by the naked eye were sufficient to cause failure. This is no longer a problem, however, because new methods of processing now change the contour of any minute accidental notches before drawing so that they no longer act as foci for stress concentration; and also, the coils are now protected before drawing to prevent accidental abrasion.

Fig. 11—Tandem bench in operation drawing stainless steel. This machine is capable of making 6 passes, reducing the wire from ¼" to 3/32"—a reduction of about 25% on each pass.

Type 446, a 27% chromium ferritic steel used for its excellent scaling resistance, is another example of a metal which was highly brittle during drawing, particularly in the large wire sizes. This vexing problem was solved too by the discovery that the steel possesses a ductile-to-brittle transition zone in the order of 125°F. Coils which formerly were as brittle as glass under draw bench loads may now be drawn to substantial reduction by warming them to 140-150°F. This is accomplished by immersion in a lead bath and utilizing the residual heat of the leading operation. Once an initial reduction is made, the wire may be further drawn without undue trouble.

★ ★ ★

Similarly, stress-cracking of the free-machining stainless steels, due to the directionality imparted by the deliberately-introduced free-machining elements, sulfur and selenium, often caused losses. Careful metallurgical control and research, which revealed no less than seven separate causes, ranging from die contour and lubrication failure to methods of pickling and heat treatment, have made this once-costly difficulty a relative rarity. Today, these highly directional steels are drawn as readily as their non-free-machining counterparts.

(*Please turn to page* 1028)

* "The Cold Work Hardening Properties of Stainless Steels in Compression," by F. K. Bloom, G. N. Goller, and P. G. Mabus.

The Production of High Carbon Steel Wire

by Stewart S. Gray
Assistant Vice President
Union Wire Rope Corporation
Kansas City, Missouri

A paper delivered before a Regional Meeting of The Wire Association held in Houston, Texas, May 7 and 8, 1959.

To attack the subject properly, it is best to dismiss from consideration these phases of the production of high carbon wire:

The preparation of special surface conditions such as various chemically or electrically deposited coatings; the application of protective or ornamental coatings deposited by a hot dip method; and the field of oil tempered wire.

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Because of the writer's lack of familiarity with the subject, the paper is limited to that with which the writer has some familiarity—the production of:

Rope Wire, Furniture Spring Wire, Tire Bead Wire, and Prestressed Concrete Wire.

★ ★ ★

The great majority of all rope wire and tire bead wire requirements may be handled nicely by a .70 carbon, .70 manganese hot rolled steel rod. Furniture spring wire, because of the subsequent tempering after the formation of the spring, uses .50 or .60 carbon material with about 1.00 manganese. The choice in carbon is dictated by the finished tensile desired. Prestressed concrete material for single wire and for the 7-wire strand, uses .80 carbon, .70 manganese steel. This same analysis, because of equipment and patenting limitations, is used in the larger diameter rope wires, generally, sizes larger than .100.

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If the wire producer receives good clean steel rolled at the proper temperatures and speeds, he is well on the way to the manufacture of a high quality material. We feel that with good steel, we have minimized our problems.

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Virtually all finished high carbon wire has a specification either in writing or by implication that the material be drawn from a patented structure. This patented structure seems to have remained the same through the years. The metallurgists have given it a number of different names. Presently, in our organization, we refer to the desired grain structure as a fine lamellar pearlite.

★ ★ ★

The formation of this structure, as with so many heat treating operations, is a time and temperature combination which will vary with particular analyses and the patenting equipment available. In the field of patenting there is a wide difference in temperature and speed through the industry. It is difficult to argue with success, so even if you don't go by the book and you are able to draw a high quality product as a result of your efforts, that is the patenting method to use.

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The patenting operation may include many variations:

Heating in a direct or indirect fired furnace; Controlled or non-controlled atmosphere; Quenched either in the patenting room air, molten lead or salt.

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The desired results in the end product determine the method used.

★ ★ ★

Following the patenting operation, it is necessary to remove iron oxide that will be present by:

The use of reverse bending through sheaves;
Blasting with shot; or
The conventional pickling operation.

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The pickling operation, generally, uses sulphuric acid in water at temperatures from 120 to 160°F., and from 2 to 10% by volume of acid. When particularly clean surfaces are required for subsequent plating, muriatic acid may be employed along with or in place of sulphuric acid. Rather than being a chemical process, this pickling is actually a mechanical process. When the acid attacks the steel, free hydrogen is evolved which explodes out from the surface of the steel. This violent, confined action knocks loose any iron oxide that may be present. After the scale has been removed, the acid is removed and neutralized by flushing or spraying with water.

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Now begins the build up of the lubricant carrier coating. It may be a dip in lime, a lime coating substitute material such as borax, or some of the more complex phosphate coatings. This dip completes the neutralization of the acid as well as providing the first element of the coating for the subsequent wire drawing operation. The material is then baked or dried in some fashion. In the past years, there seems to have been a trend away from lime coating on high carbon steel for drawing. Most of the furniture spring wire users still require a coating built up over a lime coat. For reasons of cleanliness and facility of recoating, lime substitutes are in great favor.

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After the proper drying, which now seems important just to dry the last liquid dip, the material is ready for the drawing operation. Years ago before the successful development of acid inhibitors, the drying operation was very important in the removal of the hydrogen which penetrated the steel during the pickling operation. From our own experience, even in the case of over-pickled or acid burned steel, we don't recall any clear cut

(*Please turn to page* 1025)

The Houston Regional Meeting

by Edmund D. Sickels, Editor
Wire and Wire Products
Stamford, Connecticut

While the number of persons attending this meeting was fewer than hoped, it was more than actually expected due to the distances that separate Houston from the large wire centers. Nevertheless the affair proved to be one of the best of our Regional meetings in all respects.

An excellent Regional Meeting of **The Wire Association** held at Houston, Texas, in the Shamrock Hilton Hotel on May 7 and 8, 1959, has become history.

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The registration desk opened at 9:00 A.M. on May 7 and in the course of the day 108 persons registered for the various events and received their badges.

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At 12:00 noon a luncheon was tendered by the Program Committee to the Association directors present and the program participants. At this luncheon **Allan B. Dove**, as President of the Association, welcomed and thanked the speakers and committeemen, expressing his gratification at the good turnout for the meeting.

The Technical Session

In the afternoon the technical session opened at 2:00 P.M. with **Theodore B. Dull**, Superintendent of Wire Mills, of the **Sheffield Division, Armco Steel Corporation**, Kansas City, Mo., serving as Chairman of the meeting.

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The first paper was "In-Line Processing of Rod to Wire for Cold Heading", which was given by **R. C. Rhoades**, Works Manager of the **Sheffield Division** in Kansas City.

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Next on the program was **Earl A. Bowers**, Vice President of **Standard Industrial Compounds Company**, Frankfort, Ill., who spoke on the "Advanced Lubricants and Pressure Dies for Better Wire Drawing."

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Gilbert C. Klingel, Mill Representative of the **Baltimore Works** of **Armco Steel Corporation**, Baltimore, Md., then presented a paper "The Production of Stainless Steel Wire."

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The final paper, "The Production of High Carbon Steel Wire", was given by **Stewart S. Gray**, Assistant Vice President, **Union Wire Rope Corp.**, Kansas City, Mo., another Armco division.

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The papers were well-received and were types that added considerably to the know-how of those present.

Cocktail Hour and Dinner

At 6:30 P.M. a pleasant interlude was enjoyed by 130 persons in the Emerald Room, including the ladies, providing a period of restful relaxation from the busy afternoon and an opportunity to become better acquainted with fellow industry men. The cocktail hour was made possible by the generosity of Standard Industrial Compounds Company, who were the hosts.

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The doors to the Grecian Room were opened for dinner at 7:30 P.M. at which time a bountiful repast was relished by 144 people.

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The after-dinner speaker, **Frank Morris**, a Texas humorist who has achieved nation-wide recognition as an interesting speaker, lived up to his reputation with an entertaining and enjoyable talk.

The Plant Tour

Busses left the Shamrock Hotel at 9:00 A.M. with 86 men for Armco's Sheffield Division plant on the outskirts of Houston. This plant was placed in operation in 1942, has been expanded considerably since then, and is now the largest steel mill in the area. Its facilities include a blast furnace, open hearths, soaking pits, electric furnace, coke ovens, blooming mill, and equipment for producing plate, tank heads, merchant products, rod, wire, and welded wire fabric.

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On the way to the plant the group was taken on a sight-seeing visit to Houston Harbor, where Japanese, Belgian and other foreign bottoms were unloading cargo—some of it being wire, barbed wire, concrete reinforcing bars, and wire mesh.

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The tour covered all departments, and the trip through the wire mill in particular was highly satisfactory in all respects. One of the interesting machines that drew attention was a brand new Vaughn dead block. The tour was well-managed, well-worthwhile and the company's guests were grateful for the courteous attention shown them.

The Barbecue

An old-fashioned Texas Barbecue at the Texaco Country Club officially wound up the two-day meeting. This proved to be the highlight of the entertainment portion of the program, the memory of which will linger long in the minds of the men whose good fortune it was to be in Houston for this Regional Meeting. About 100 persons enjoyed the barbecue.

The Ladies

Thirty ladies had come with the men to Houston and, for their entertainment, a three hour tour of

(*Please turn to page* 1024)

New Extrusion Techniques With Silicone Rubber

by H. H. Bashore, E. G. Schwarz and C. E. Simpson
Union Carbide Plastics Company
Division of Union Carbide Corporation
New York, New York

This paper was delivered by Mr. Schwarz at the Seventh Annual Symposium on Technical Progress in Communication Wires and Cables in Asbury Park, N. J., on December 4, 1958. The meeting was sponsored by the U. S. Army Signal Research and Development Laboratory.

The electrical industry consumes a larger volume of silicone rubber than any other single user. This is not particularly surprising, since the ever increasing demands for more power, usually combined with a need for reduced size, have pushed operating requirements beyond the limits of organic rubber. Only silicones provide flexibility over a temperature range of from — 150°F to over + 500°F., combined with good insulating properties and corona and arc resistance. An added feature of silicone rubber is that even subjected to fire, it leaves a silica residue that retains insulating values for emergency operation.

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Unfortunately for the wire and cable manufacturer, the emphasis during the past few years has been on improving the properties of the silicone compounds, while little effort has been put towards improving the handling characteristics of the materials. And yet, from the standpoint of the wire and cable manufacturer, it is the handling characteristics of a compound that are most critical. Therefore, it is with a great deal of satisfaction that we can announce today the solution of most of these problems—through the introduction, by Union Carbide, of direct-feed silicone rubber compounds.

The Concept of Direct Feed

When silicone rubber was first introduced it was natural to try to follow accepted production methods of the wire and cable industry. However, instead of compounding from base polymer as was done with organic rubber, the manufacturers purchased finished compound directly from the silicone supplier. The fabricator was then required to replasticize the compound on a mill and add color if desired. At this point the compound usually was stripped from the mill, dusted, coiled, and transported to the extruder. If a delay occurred, or too much compound was prepared, the material frequently had to be returned to the mill room for refreshening. Then the stripping, dusting, and coiling had to be repeated. Thus the fabricator was required to handle a compound more than once before actually starting to coat wire. Early attempts to "preform" silicone rubber compounds into strip-feed stock failed, due to the very limited storage life of conventional silicone rubber compounds in the plastic state, i.e., they built structure very quickly. Therefore, with this in mind, we undertook the development of direct feed compounds. This work had its origin over two years ago when Union Carbide introduced a family of premium grade silicone rubber compounds with the unique feature of being "preconditioned." For the first time compounds were ready for fabrication after a few passes on a mill—even after months of storage. This is in contrast to the earlier replasticizing operation: a compound would crumble and fall from the mill on the first pass. These crumbs then had to be shoveled back onto the mill again until a continuous sheet was formed.

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This development greatly simplified compound handling for fabricators. However, wire and cable manufacturers were still required to sheet strip, dust and coil the compound. In addition, extra effort was usually required in cleaning processing equipment, due to the danger of contamination of the silicone by organic materials. Therefore, we embarked on the next logical step — the preparation of a compound that could be fed into the extruder directly from its shipping container. This was a major problem, since preconditioning—to avoid remill—had to be balanced with enough green strength and rigidity to allow the compound to be taken up by an extruder screw. At the same time, recipes had to be rebalanced to maintain optimum properties.

Direct-Feed Strips

The first form chosen for the new direct-feed compounds was a catalyzed strip cut from a mill, and dusted lightly to prevent sticking. Refining this technique, we devised a process for providing the wire manufacturer with a uniform strip, dusted and spiral-wound in flat coils, ready for extruder feed. Dimensional uniformity and selection of optimum core and coil size were critical. Cross-section dimensions have been standardized at 2 in. x ½ in. In-plant experience has shown that this size is the most adaptable to a wide variety of wire sizes. A single strip maintains a sufficient supply of compound for small wire sizes; while for larger gages two or more strips are fed simultaneously. (See Fig. 1) Two coils, together weighing twenty-five pounds, are packaged in a crush-proof box. As shown in Figure 2, each coil rests on a pallet of boxboard for easy handling While our shelf life tests have shown that catalyzed strips can be stored almost one year and still be fed directly to an extruder to produce smooth wire insulation, strips should probably be used within two to three months after receipt. This

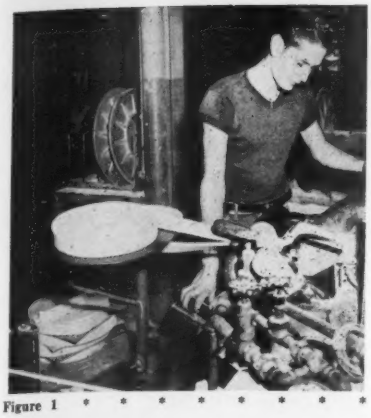

Figure 1 * * * * * * * * *

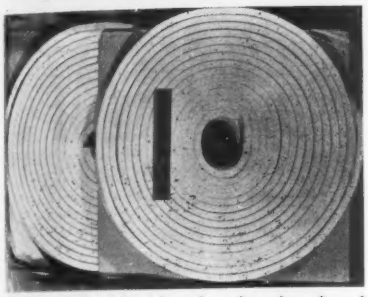

Figure 2 * * * * * * * * *

is in keeping with the best silicone rubber practice — primarily to guard against catalyst loss or deactivation.

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In using these strips, no modifications of the basic extruder are required. Feeding an extruder is merely a matter of placing a coil on a freely rotating table, and properly positioning the free end of the strip into the extruder throat. Figure 1 shows a typical installation. While mechanized feed rollers are usually used, frequently, strip-feed stock can be pulled into the extruder by the action of the screw alone. However, in this case idler rolls are advisable. After evaluating direct feed strips on small scale wire coating in our own laboratory, full scale trials were carried out in wire and cable manufacturing plants.

In-Plant Experience

The first production trials of direct feed compounds on wire was for Underwriters Laboratories Class 22 Fixture Wire and Class H Motors Lead Wire. No changes were made in the plant's wire coating equipment, although any extruder screw normally used with silicone rubber is suitable for direct feed strips. A screw compression ratio of about 2:1 is recommended. To date situations requiring higher ratios have not been encountered. While higher compression ratios can be used, controlling insulation diameter without compensating by die size change can pose problems. Since less handling reduces the danger of contamination, screens are not required in the extruder. This means that extrusion rates can be increased, while minimizing the danger of back pressure and overheating, which could result in scorching of the compound. In one series of runs, wire speeds approaching 600 feet per minute were maintained, at no sacrifice in the degree of control maintained on the insulated wire diameter. This is possible because the pre-formed strip insures a more uniform feed rate than is ever possible by conventional hand or ram feeding.

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Residence time in the curing medium, not feed characteristics of the compounds, turned out to be the controlling factor in production rates. Most of our experience to date has been with continuous (steam) vulcanization. Depending on insulation thickness, dwell times of 30 to 70 seconds in 120 to 160 psig steam give good cures. However, further processing or individual specification requirements may make a post cure advisable.

Compound Properties

During development, each change in compound formulation to control feed characteristics demanded a further rebalancing of the compound to maintain physical and electrical properties. Neither could compound cost be neglected. The first two members of the Union Carbide K-1050 Direct-Feed family were sixty and seventy durometer compounds, designated K-1056 and K-1057 respectively.

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Wire and cable insulations are often given something between an initial cure and a postcure. Modulus, particularly with K-1057, increases rapidly with only a slight additional cure. This is particularly important where the insulation is to receive a braid, and rubber "strike-through" must be avoided. Typical properties of direct feed K-1057 on wire, compared with the requirements of Underwriters Laboratories Class 22 Fixture Wire, are shown in Table I. It is significant to note the retention of physical properties after heat aging, exceeding the requirements of this specification. Electrical properties surpass those required in Underwriters Laboratories Class 22 Fixture Wire and Class H Motor Lead Wire. Typical electrical properties are: volume resistivity, about 2 x 10^{15} ohm-cm; dielectric strength, about 1000 volts/mil on a twenty-five mil slab; and dielectric constant at 100 cps., 4. 4.

★ ★ ★

While direct-feed silicone rubber strips fulfilled all our expectations, we were still looking for a more convenient way of feeding compound to the wide variety of extruder sizes in use—a more universal form. Strips, experience showed us, worked best when a large volume of one wire size was produced. Very small wire sizes, and small quantities of many different sizes could be made more conveniently from a more flexible form.

TABLE I

Evaluation of UNION CARBIDE K-1057 Silicone Rubber SF Fixture Wire

	Wire Gage	Wire Finish	Wall Thickness	Original Physicals: Tensile (psi)	Original Physicals: Elongation (%)	Heat Aged 60 Days at 210°C.: Tensile psi	Heat Aged 60 Days at 210°C.: Tensile % of Original	Heat Aged 60 Days at 210°C.: Elongation %	Heat Aged 60 Days at 210°C.: Elongation % of Original
Evaluation of UNION CARBIDE K-1057 on Wire	18	Bare	0.031 in.	845	295	1120	133	95	32
Specifications	UL SF Fixture Wire			500	100	--	60	50 and/or 25	

Of the possible forms, pellets proved most satisfactory.

Pelletized Silicone Rubber

Union Carbide silicone rubber pellets are small catalyzed cylinders—about ¼ inches in diameter and ⅜ inches long. These are shown in Figure 3. Plant trials

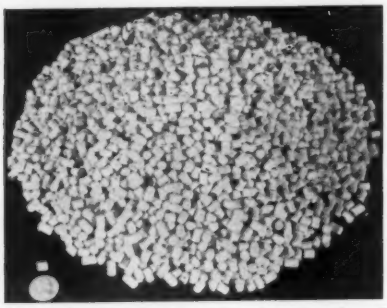

Figure 3

showed that this is the optimum size and shape. As they are continuously produced, pellets are coated with a controlled excess of dust—enough to prevent the pellets from sticking together, and yet not so much that physical properties suffer from undispersed surface dust. As in the case of strips, formulations had to be further rebalanced to maintain optimum properties. The maximum allowable depth of pellets was determined and a shipping container designed to avoid excess weight which would deform the pellets. Storage life tests show that pellets can still be fed directly to an extruder after as long as two months with ambient temperatures reaching 90°F. to 100°F.

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While almost any commercially available pellet feeder could be modified to handle silicone rubber pellets, it was decided that designing an original unit would teach us more about feed problems, and enable us to make more intelligent recommendations for modifying the wide variety of feed equipment already in use for other extrudable materials. As anticipated, the most serious problems to overcome were bridging of pellets in the extruder throat and holdup in the feed mechanism. These were solved, largely by the design of the pellet feeder.

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Since the prototype unit had to be portable for field evaluation and demonstration, aluminum was used wherever possible to conserve weight, and adjustable legs enabled us to operate with different size extruders. A variety of sheet metals and supporting devices could be used for permanent installation. The essential features of the prototype model shown in Figure 4 are the two vibrators, one on the hopper, the other on the feed tray. The entire unit can be built for about $250. Designed undersized for portability, the hopper holds about one hundred pounds of pellets. A production model should probably have a larger capacity and be wider and more shallow for ease in checking and replenishing the pellet supply. Vibrating agitators are preferable to stirrers to avoid deforming the pellets.

Pellet Feeder Operation

Typical startup procedure using the prototype pellet feeder (Figures 4 and 5) consists of:

(1) starting both the vibrator on the hopper and the feed tray, and allowing the extruder throat to fill with pellets.

(2) starting the extruder and allowing the barrel to fill with compound.

(3) starting the wire, bringing it to speed quickly and adjusting the vibrators so that the pellets just begin to back-up in the extruder throat.

★ ★ ★

Each extruder-wire size combination will have an optimum pellet level, best determined by operating experience. Minor adjustment of the vibrators is enough to keep the pellets at constant level in the extruder throat.

★ ★ ★

As with direct-feed strips, pellets underwent considerable in-plant testing in the production of Class H Motor Lead Wire and Class 22 Fixture Wire. The same advantages accrue to pellets as to strips with additional flexibility. With the flick of a switch, wire production is started or stopped and compound is ready instantly. The pelletized K-1050 series is available in two Shore A durometers: sixty and seventy, designated K-1056 and K-1057 respectively.

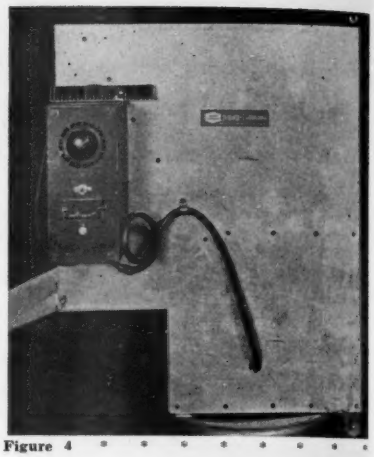

Figure 4

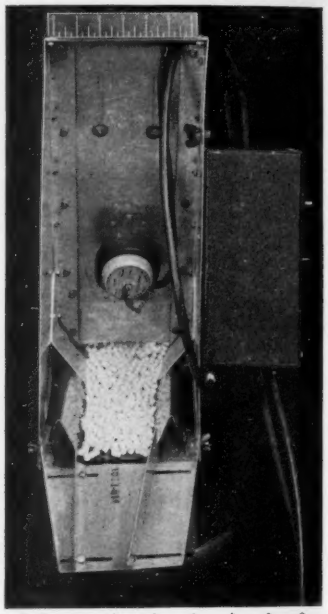

Figure 5

Other Uses of Direct-Feed Compounds

While intended primarily for extrusion wire coating, direct-feed compounds have been used successfully in transfer molding and injection molding. Here, direct-feed pellets and strips can be charged directly from shipping container to mold. This feature is particularly useful for small volume jobs requiring fast delivery without interruption of existing production schedules. Extension of mechanical goods or preforms for molding follows the same general procedure as wire coating. Another area being investi-

(*Please turn to page* 1020)

High Frequency Resistance Annealing of Wire

by David G. Osterer
Vice President
New Rochelle Tool Corporation
New Rochelle, New York

Sometimes a pot of gold lies on our doorstep unrecognized. This article describes an old principle in this category that not only has been recognized, but put to practical use in the annealing of wire.

Introduction

High-frequency resistance heating is not a new technique but rather one that was lying dormant and now has been revived, and found to possess many industrial applications. High-frequency power for induction heating on the other hand has had an uninterrupted development over the years and today is a standard tool in industry.

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For many years it was known that the resistance of metal to a current passed through it causes a heating effect. What was apparently overlooked is the simple fact that high frequency current can be brought directly into the object to be heated by contacts as well as by transformer action or induction.

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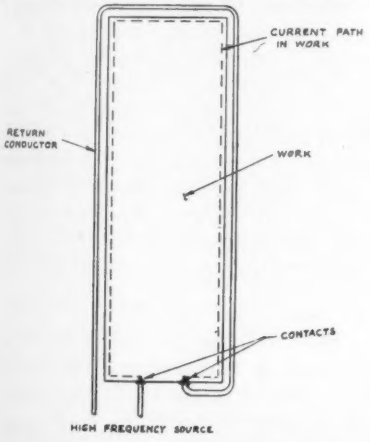
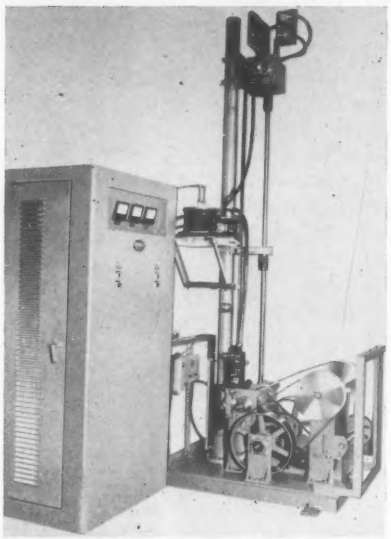
The use of contact methods to bring high-frequency current into a piece of work results in several peculiar effects, all stemming from the fact that current flows in the low-inductance path, not necessarily in the low-resistance path. For example, if two contacts are placed



HIGH FREQUENCY RESISTANCE HEATING
FIG. 1



High Frequency Resistance Annealing Unit—the Thermatrol. * * * * * *

on a piece of metal approximately 2 in. apart, and 60-cycle (low frequency) voltage is applied, the current will flow between the contacts in a somewhat uniformly distributed fashion depending upon the resistivity of the workpiece.

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If high-frequency voltage is applied to these same contacts, it is possible to have practically no flow between the contacts and yet have a very high percentage of the current flow a distance of 40 to 50 in. over a path at a considerable distance from the contacts. This unexpected effect is achieved by simply making the path, through which the current flows, the low-inductance path. The low-inductance path is normally the path which is closest to the return conductor of the circuit and this is the basis for all high frequency resistance heating. The current is permitted to flow through the work for a portion of the total circuit; the balance of the circuit is composed of a return conductor which follows closely (but is not in contact with) the path through which the current is desired to flow.

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Figure 1 illustrates this basic principle, in heating a bar of steel around the outer three edges. Contact is made at two points on one end and the return conductor goes around the outer periphery back to the source. The current in the work flows in the dotted path, not between the contacts.

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Another simple version of this phenomenon is shown in Fig. 2. Here two contacts are placed in a sheet of metal with the return conductor from one contact extending over a much longer path than the distance between the contacts. The actual path by the current is shown by the heated zone.

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In creating a path of low inductance we are utilizing the natural tendency of the current to flow as close as possible to the return conductor. In this phenomenon, which we might call narcissism, the cur-

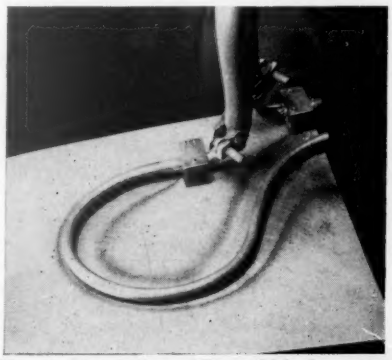

Fig. 2—Heat pattern follows (high frequency) return conductor. * * * * *

rent "loves" to get next to itself or to "hug itself." This electrical phenomenon has many uses which are now being applied to industrial processes; for example, the hardening of chain saw guide bar edges and hardening of shear blades.

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In another application, extremely high temperature differentials are regularly achieved under continuous processing conditions. For example: many different types of metals are formed into tubing and continuously welded with high frequency. Current is fed by sliding contents to the edges being joined, and the metal heated to the fusion point in a few thousandths of a second. These results are secured because at high frequencies, current needs are relatively low and the voltages comparatively high. This same relationship can be invoked to induce comparably high rates of heat in a continuously moving wire.

Thermatool Wire Annealer

Utilizing these principles of high frequency resistance heating, a radically new method of annealing wire has been developed by the New Rochelle Tool Corporation and is now being marketed. This equipment has been operated, for the last year, by the Seymour Manufacturing Company of Seymour, Connecticut in the manufacture of an improved quality of bronze wire. This wire is being processed for subsequent redrawing of wire. 005" to .015" and eventually intended for use in Fourdrinier wire screening.

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The Thermatool annealer passes 450,000 cycle current directly through the wire and heats it by high frequency risistance losses, and no arc or pit marks occur. The wire passes into a feed roll system which guides it vertically through a seven-foot glass-lined tube. (See Figure 3). High frequency current enters the wire at the top and leaves at the bottom by means of contacts. The lower six inches of the unit is a quenching device, which removes the heat from the wire before it hits the lower contact. The tube around the wire acts as a coaxial return conductor.

The wire carries several hundred amperes of current between the two contacts and in travelling rises in temperature to some pre-set value, such as 1250°F., and then enters the quench. The quench extracts the heat from the wire and allows it to hit the second contact in a nearly cold condition. If it hit the second contact in a hot condition the wire would be marked.

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The equipment includes a generator, water pump, input voltage regulator, a mechanical wire guiding and feeding device, and an automatic length compensator for changes in length of wire during the annealing operation. The device is a complete package unit which can be installed in a wire drawing line as an interim annealing operation, or as an annealing device for transferring wire from one reel to another, annealing in the process.

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No wire pulling or reeling devices are included with the equipment, as the pulling is usually done by a wire draw mill or bull block.

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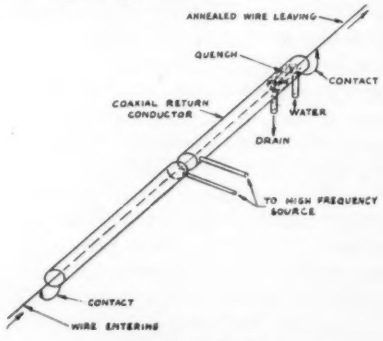
At the present time, the equipment is limited to wire diameters between 0.128" and 0.030", and two sizes of power supply are available, 25 kw and 60 kw. A 25 kw unit will produce 300 lbs. of bronze wire per hour (700 ft. per minute for 0.051" diameter, or 100 ft. per minute for 0.128" diameter). A 60 kw unit will produce 600 lbs. of bronze wire per hour. Production of other metals is dependent upon the temperature required for annealing and the specific heat. Larger capacity machines are capable of higher production.



WIRE ANNEALING
BY HIGH FREQUENCY RESISTANCE HEATING
FIG. 3

The mechanical feeding and guiding device is limited to a top speed of approximately 1,500 ft. per minute. The floor space necessary for the mechanical guiding and feeding device and automatic length compensator is 4 by 3 ft. and the equipment is about 11 ft. high. The floor space required for the high frequency generator is dependent upon the size unit employed. The 25 kw generator is three by four feet and seven feet high. The 60 kw is slightly larger.

Advantages in the Use of High Frequency Resistance

Many practical advantages are inherent in high frequency resistance annealing, a number of which are cited:

Small floor space requirements, units can be easily inserted between drawing dies, and annealing done on the fly.

The equipment permits speeds up to at least 1500 feet a minute.

A consistently high quality product results from this method, with the hazard of variations, with arc and pit marks eliminated.

The grain structure is quite different than that achieved by conventional methods of annealing, and the drawing properties of the wire are considerably improved.

The color of the resultant product is excellent.

There is no scaling or oxidation.

The unit can be used interchangeably for ferrous and non-ferous metals. Most metals that are not hardenable with a quench can be annealed by high frequency resistance.

Low operating cost.

Two semi-skilled workmen can operate the equipment.

Push button control.

The down time is negligible.

Discussion

Wire producers have long sought a better and more economical method of annealing quality product on a continuous basis, but the batch type furnace has been the tried and true procedure for years. The only variation of this conventional method has been the introduction of various inert or reducing types of atmosphere to minimize or stop scaling and oxidation.

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The passing of coils of wire through a furnace on a conveyor half million dollars for one basic production unit.

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(*Please turn to page* 1029)

De-Bugging Electronic Controls

by Elden G. Fox
Senior Electrical Engineer
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Kaiser Aluminum & Chemical Corporation
Newark, Ohio

Electronics, our wonder working science, performs miracles in many fields. Certainly in radar, communications, computors, guided missiles, etc., electronics are a must. In some instances, when it comes to controls of industrial equipment, a somewhat different approach should be exercised by the designer. Industrial controls must be rugged, reliable, and capable of converting electrical power to many tasks of mechanical output demanded of it in the machine. But above all, the controls must be as simple as possible. Too often a simple control problem finds its way into the electronic design section. When it gets out into the field, one finds the makings of a television station trying to do a job that a few basic control schemes using ordinary contactors and timers could easily handle.

* * *

The following case story illustrates just that point.

* * *

At Newark, Ohio, our company has a large aluminum fabricating plant. Among the products manufactured are aluminum wire and cable, both bare and insulated. One of the operations in making wire is drawing it down from aluminum rods as rolled by the rod mill to the various sizes required for stranding into wire and cable. Rod is fed into a drawing machine, to go through a series of dies, that draw it down to smaller diameters of required sizes. Then it is wound on a spool and is ready for further processing.

* * *

Wire drawing sounds fairly simple. That is, it was simple until the cry for more production and reduced costs called for higher drawing speeds. Along with the speed problems came new alloys and wire of greater tensile strength, calling for more horsepower.

Elden G. Fox

This article is a description of the manner in which some wire drawing problems were solved, especially with reference to machine controls.
The author graduated from the U. S. Air Force School of Electronics and served three years as a member of the Army Airways Communication Service. He graduated in 1952 from Tri-State College, Angola, Ind., with a B.S. degree in Electrical Engineering, at which time he joined Kaiser as a plant electrical engineer. During the past year he has been assigned to the Electrical Conductor Division's promotional and technical development staff.

* * *

The whole secret is in keeping the wire under constant tension while it is being taken up on the spool so the wire will not cross wind on the spool and break from too much tension. What we have are two distinct machines—a wire drawing and a take-up machine, or spooler, as it is called. The two drives must be coordinated to the right speed to maintain the proper tension on starting, running, and stopping. It is not the intent of this article to go into the various pieces of equipment. It concerns one type of drive that we feel was far too complicated to begin with, the troubles we ran into, how we solved them and obtained a simple drive, that works, while the "super drive" could not be relied upon.

What We Wanted

Our specifications were simple. We wanted a control that did these things—

1. **Operated the machine at the required speeds**
2. **Maintained those speeds at all times**
3. **Would accelerate within a given time**
4. **Would stop within a given time**
5. **Maintain proper tension over the whole cycle**
6. **Operate with a minimum amount of downtime**
7. **Be as simple as possible for easy maintenance.**

* * *

At first glance, the above specifications might seem to be quite elaborate. Actually, they are not elaborate. All of these features were found in our older machines which were driven by AC wound rotor motors. Three speeds were obtained by means of gear boxes. In order to cover a wider range of speeds and loadings, it was decided to go to variable voltage DC drives and this is what we ended up with.

What We Received

A so-called packaged drive was delivered to us. The main motor was driven by a variable voltage control panel from a motor generator set. The controls were all electronic and the fields of the main motor and generator were fed from rectifier tubes. These tubes received their regulation from an amplifier panel.

* * *

The spooler motor, also, was con-

trolled by a packaged variable speed drive consisting of electronic controls and a motor generator set. Coordination was made possible by interconnecting the electronic panels and with tachometer generators on the motor shafts. In theory, the spooler control would follow the output of the machine over its entire range of speed, constant tension would be applied at all times and the machine would accelerate and decelerate without breaking wire or throwing slack. In practice, however, the controls had no respect for theory. They simply would not behave.

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For instance:

1. **The machine could not be stopped in 5 seconds as required by safety without breaking the wire every time.**
2. **The main drive motor could not be stabilized. It would oscillate violently on acceleration and while running at full speed.**
3. **Downtime was excessive. The controls were constantly getting out of adjustment.**
4. **Stopping the drive would result in breaking wire or throwing slack wire on most stops.**
5. **Production output of the machine was below the output of older machines in operation for a number of years and the production superintendent was constantly complaining about excessive downtime.**

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The manufacturer of the drive wasn't exactly happy either. Engineers from the factory lived with the controls. Test meters, oscillographs, brush recorders, etc., covered every available space on the control platform. Top talent tried this and that remedy, yet it seemed that solving one problem led to another of a different type. The net results were that the machine, while steadily being improved, still left much to be desired.

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After three weeks of testing and engineering research, the manufacturer's engineers left us to go back to the factory and do more research, especially on the electronic acceleration and deceleration controls. The stopping time of 10 seconds was too slow for our requirements of 5 seconds. Oscillation still occurred during acceleration and running.

For two months our engineering and maintenance departments tried to stabilize the operation. By careful control adjustment, a few spools of wire could be produced in a satisfactory manner. Yet the next morning, the machine was erratic again. The controls were too sensitive and there were too many tubes, resistors, condensers, etc., that needed replacing or adjusting for any "by-day" operation.

What We Did

All of our troubles seemed to finally end up in the electronic control of the main motor drive. Therefore, our engineers decided to go back to fundamentals of control and start over, using basic control systems. We came up with the following method of analyzing the troubles and planning new solutions to our problems.

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We broke down the functions as follows:

Main Drive

1. **A 200 HP D.C. motor had to be started.**
2. **A 200 HP D.C. motor had to be kept running at a predetermined speed.**
3. **A 200 HP D.C. motor had to be stopped.**

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No. 1 was not much of a problem. D.C. motors have been started for seventy-five years using basically two methods, varying the line voltage or by means of resistors in the armature circuit where it is impossible to vary the line voltage.

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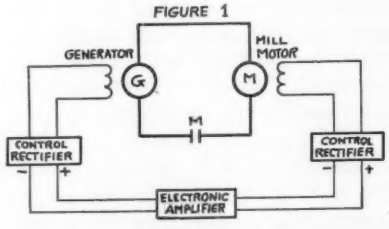
In our case, we had a means of varying the line voltage. The power diagram is shown in Figure 1.

FIGURE 1



No. 2 resolved itself into stabilized field control. This motor ran at 575 r.p.m. at full line voltage and at 1200 r.p.m. with field weakening. A voltmeter check on the generator and motor fields showed that the D.C. input to these fields was erratic. In fact, at times the D.C. motor field actually had no input.

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No. 3—There are three ways of stopping a D.C. motor:

a. **Cut off its power and let it coast to a stop.**
b. **Use the motor as a generator and feed back against its own generator or regenerative braking.**
c. **Use the motor as a generator and feed back against a resistance or dynamic braking.**

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Again, steps two and three are not new. Ever since D.C. motors came into being, the above methods were being used. What, then, was the trouble with the drive?

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Under the original control, the generator and motor fields were fed from D.C. rectifier tubes which, in turn, were controlled by an electronic amplifier. The idea was to use small amounts of control power to handle large amounts of field current. Also, finer controls and smoother acceleration was to be the result. The only trouble was that these small amounts of control power were sensitive to A.C. voltage changes in our plant, plus oscillating conditions within the amplifier itself; the net result was a variance of amplified power in our generator and motor fields. This caused the motor to start erratically and hunt all over the map after it came up to speed, which caused wire breakages and endangered the mechanical parts of the machine.

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All we did was to disconnect the electronic amplifiers and substitute a steady source of D.C. input to our rectifier unit. In fact, we used an ordinary 50 volts of radio batteries, dug up a "Multi Flex" timer out of our scrap pile to cut out a number of adjustable potentiometers mounted on a wooden board and we had speed control that was as steady as the Rock of Gibraltor.

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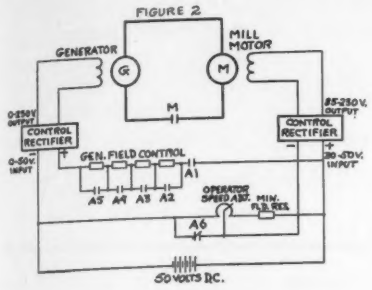
Our control scheme was now as

shown in Figure 2.



Our acceleration, of course, was not as smooth as we wanted. (For that, we needed a motorized potentiometer to replace the stepped resistors, which was later installed.) But, it brought the motor up to speed quickly without breaking wire and, most important, it functioned the same way on every start. As for speed control when up to predetermined speed, the motor now having a stable voltage from a stable generator output, the stabilized field ran smoothly with no variation at all. Later on, we substituted a 50 volt D.C. source from a constant potential generator for the radio batteries with no change in operation reliability.

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The next problem was in stopping. Using our new control method, when we pressed the stop button, the generator field collapsed to zero so that the motor now being used as a generator pumped back against the resistance of the armature of the generator alone. This caused a high current to flow and stopped the machine in 2½ seconds. This was too fast, both for commutation purposes and mechanical strain on the machine. We tried to prevent the generator field from collapsing so fast so it could act as regeneration, but the types of controls we had were too erratic and the time interval too short for smooth stopping.

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So, we inserted a resistor (also rescued from the scrap pile) across the contacts of the main line contactor (see Figure 3) and arranged to drop out this contactor to "stop". This resistor plus the resistance of the generator armature limited the current of dynamic braking so that we could adjust the stopping to 5 seconds from full speed. The slower stop reduced our sparking at the commutator of the drive motor due to less current and, also, brought the machine to a smooth stop with no strain on the bearing. Best of all, the 5 seconds stopping came up on every stop.

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We could now start, run and stop the main machine the way we wanted to. Now the next step was the spooler.

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All this time that we had been having trouble with the machine, we had not been having too much trouble with the spooler. Even as wildly as the main drive performed, the spooler somehow managed to keep up and follow the main drive. The main trouble with the spooler was in stopping. Starting and running seemed to be okay.

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In stopping it is necessary to have the spooler motor follow the main drive to a "split hair" so that current tension is maintained all the time over the whole stopping cycle. If the spooler drive stops too fast, slack wire will be thrown on the spool which leads to cross overs and breakages in later operation in which the spool is used. If the drive stops too slowly, the wire breaks by the festoon arm due to all the storage being taken up with the spool still running. Now, came the question of how to stop the spooler and satisfy both the above conditions.

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Stopping is normally done in three ways:

1. **Using a mechanical brake whose pressure can be controlled electrically.**
2. **Using electrical braking, either regenerative or dynamic, as on the main motor.**
3. **Using a combination of both.**

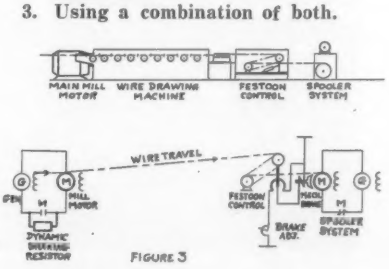

FIGURE 3

The manufacturer's engineers had tried using the mechanical brake, but this did not prove satisfactory. The electrical control did not have sufficient range to prevent the brake from "grabbing" too hard, so it was disconnected and electrical braking used alone. The braking circuit, being composed of a number of components all of which could have variances under certain operating conditions, produced erratic braking action on the spooler. The result was either broken wire epidemics or loose wire, which was just as bad.

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We first tackled the problem by seeing what could be done with the mechanical brake alone. On the first attempt, we threw approximately 1,000 feet of wire in stopping. By increasing the resistance in the braking circuit to the limit of the controls, we reduced this "slack" wire to approximately 500 feet. We didn't stop there. We added more and more temporary resistance to the braking circuit until we stopped the spooler with no slack wire and under wire tension. We noticed that when we reached this point, at times at the initial part of the braking cycle, the brake was "too soft" so that we would break wire. The spooler did not decelerate fast enough so that it took up the storage wire and the festoon arm broke the wire. Obviously, the mechanical braking could not do the job alone.

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We already knew the electrical braking left much to be desired. If we set the braking effort fast enough so that it would stop the spooler without breaking wire at the near stop period, the braking effort at the start of the braking cycle would decelerate the spooler too fast and it would throw slack wire at this point. The wire would be okay at the final stop. This condition was unsatisfactory. We had to have controlled tension over the whole stopping cycle.

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Under the above two methods of stopping, it seemed to us that if we set the braking efforts using the best range of each type of

(*Please turn to page* 1019)

Borax in the Wire Drawing Industry

by Grover G. Collins
Pacific Coast Borax Company Division
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New York, New York

Borax coatings for drawing steel rod have been gaining in popularity, not as a substitute for other materials, but for inherent advantages in neutralizing residual acid, corrosion protection, as a lubricant carrier, and its freedom from dust. Added benefits frequently reported are longer die life and lower lubricant consumption.

Introduction

Borax has found increasing favor as a lubricant carrier since it was first introduced to the wire drawing industry shortly after World War 2. **John A. Roebling's Sons Corporation** was in the forefront of firms pioneering in this application. Since Borax was not the first product used for this purpose, it was for several years referred to as a "substitute" material. Borax has now come into its own for wire coatings and is recognized as a highly satisfactory material for this application.

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Ferrous rod can be drawn successfully only by reducing the friction between the rod and the die. This can be done through the use of suitable lubricants such as drawing soaps or greases. These lubricants, however, do not adhere sufficiently to the rod and a lubricant carrier is necessary which will form a tenacious coating on the rod and form a porous base to which the lubricant will readily adhere. Borax performs well in this function and has been demonstrated to be an excellent carrier.

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A brief description of the procedures involved in wire drawing will provide a better understanding of this and other functions which Borax performs.

Preparation of Rod for Drawing

1. Cleaning

All mill scale must be removed from the rods prior to drawing as failure to do so will cause excessive wear on the dies and will result in off-gage wire. The method generally used for cleaning is to dip the coils into a vat of hot, dilute sulfuric acid. Time of dip, temperature of the acid, and acid concentration are variables which must be adjusted to suit requirements. In general, low carbon (below 0.30 carbon) rod requires more vigorous cleaning than high carbon rod as the patenting treatment normally used on most high carbon rod changes the nature of the scale and makes the cleaning procedure easier.

2. Rinsing

Following the acid pickling procedure used for cleaning, the coils are dipped in fresh water and then subjected to high pressure water jets to remove all traces of acid. The rod then goes to either the sull rack or Borax coating tank. A sull coat, sometimes preferred for heavier gage, is obtained by a water spray applied for several minutes, after which the coils are transferred to a drying rack for about the same period during which hot air is blown through the rods to enhance the sulling action.

3. Coating

A coating operation immediately follows the rinsing procedure. This is accomplished by dipping the coils in a tank containing a Borax solution, making certain that the coils are well open on the pin. This operation serves three primary purposes:

1. **Borax is mildly alkaline (pH 9.2) and will tend to neutralize any residual acid on the rod. This is not a substitute for thorough water rinsing, however, as the Borax will become ineffective if excess quantities of free acid are repeatedly carried into the Borax tank.**
2. **The Borax coating prevents corrosion during storage periods between cleaning and drawing.**
3. **The Borax coating serves as a lubricant carrier for the wire drawing operation.**

Baking

Use of Borax solutions will avoid the necessity for baking. Leaving

United States Borax & Chemical Corporation Operations at Borax, California. ★ ★ ★

the coils in the Borax solution long enough to reach the temperature of the bath will allow the coils to dry readily at ambient conditions. Spreading the coils on the pin will facilitate drying.

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If a baker is available, however, it can be used to advantage to accelerate drying as only a short retention time will be required.

Lubricating

Lubrication is accomplished by use of a granulated soap, grease, or paste fed through a box immediately ahead of the die. The soaps used can be either alkali soaps or metallic soaps. The wire, previously coated with Borax, passes through the box and picks up the lubricant and is then passed through a series of dies. Borax coated wire has been successfully drawn through six or more drafts, depending upon plant practice, with 20 to 25% reduction in area for each draft.

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This type of dry drawing is commonly used on most ferrous wire of about 20 gauge or larger and is sometimes used on wire as fine as 33 gauge.

Borax Coatings in More Detail

1. Preparation of Borax Solution

Fill the tank to the desired water level and heat to about 200°F. Add Borax to the concentration desired while agitating the solution to aid in dissolving the Borax. Concentrations normally used range from 10 ounces of Borax per gallon up to as high as 28 ounces per gallon, depending on the particular wire, number of drafts, type of dies, and individual shop practices. The concentration range from 10 to 28 ounces per gallon refers to regular Borax which has the chemical formula $Na_2B_4O_7 \cdot 10H_2O$. Another form, Borax 5 Mol, with the formula $Na_2B_4O_7 \cdot 5H_2O$, is more economical to use. As this form is more concentrated, savings can be realized through reduced transportation, handling, and storage costs. Three bags of Borax 5 Mol are equivalent to four bags of regular Borax. Water solutions of either Borax 5 Mol or regular Borax have identical properties when equivalent weights are used. The pH of Borax solutions is about 9.2 and will not vary with concentrations.

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A Borax concentration of 25 ounces per gallon (or 18.7 ounces of Borax 5 Mol) must be maintained at a temperature of about 120°F. to remain in solution and it is therefore advisable to keep the Borax solutions heated over any shut down periods. If the tanks are allowed to cool, large crystals will form which are quite difficult to redissolve. Solutions at room temperatures (70°F) can maintain a concentration of about 7 ounces per gallon expressed as Borax 10 Mol.

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The use of a wetting agent is usually not necessary in a Borax tank but might be preferred in some cases.

2. Maintenance and Control of Borax Solution

As the Borax solution is consumed, additional quantities of Borax and water in the ratio desired must be added to maintain volume and strength.

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A Borax solution will not deteriorate when not in use, and the life of the solution is completely dependent upon the rate at which it is used. When the pH of the solution falls much below 9, a fresh solution should be prepared. Standard pH paper is usually considered satisfactory for this purpose but a simple titration for alkalinity will give more quantitative results, and is very easily accomplished. A table of values relating burette readings to Borax concentrations in ounces per gallon will prove very helpful.

Extra Benefits from Borax

The threefold function of Borax in neutralizing residual acid, preventing corrosion during storage, and serving as a lubricant carrier has been mentioned previously. In addition to these basic functions, there are numerous extra benefits to be derived from the use of Borax:

1. **Borax is a mild alkali and non-irritating to the skin. It is easy to handle.**
2. **Borax does not cause a plant dust problem.**
3. **Borax is readily soluble in hot water and uniform coatings result.**
4. **Borax coatings are water soluble and can be readily removed with hot water when used in conjunction with a soluble soap. The coatings are more difficult to remove when an insoluble soap such as calcium stearate is used and a flash acid dip is recommended to insure a trouble-free process. Bonding action is excellent for both copper and galvanized coatings.**
5. **Borax coatings dry easily and quickly and have little tendency to pick up water from the atmosphere. Better corrosion protection results.**
6. **Borax coatings adhere tenaciously to the wire and will resist flaking off when the coated stock is moved about the plant.**
7. **Borax coatings will not deteriorate and coated stock can be held in storage for longer periods.**
8. **Borax coatings usually require less lubricant.**
9. **Borax coatings act as their own flux in butt welding rods when continuous high speed equipment is used.**
10. **Borax coatings promote longer die life due to efficient lubricant pickup.**

Special Cases

The use of Borax in drawing both high and low carbon ferrous rod has been established as described in the preceding sections. There are a few special cases which warrant further discussion.

1. Stainless Steel

Adhesion of a Borax coating to the surface of stainless steel wire is poor. Another alkali type coating has been reported to give satisfactory performance, however, and is generally used for this purpose. A Russian publication mentions the successful use of a metallic coating such as lead in the drawing of stainless steel.

2. Nail Wire

In the past, some wire drawing firms did not find Borax coatings completely satisfactory for wire used to form nails as some slippage occurred in the nail forming machine. This difficulty has now been overcome and Borax is being used with complete satisfaction in association with lubricants which are reported to leave a preferred dull finish and to avoid nail whiskers.

(*Please turn to page* 1016)

Impact of Equipment in the Industrial Fastener Field

by J. L. Humphrey
Manager Industrial Fastener Sales
Bethlehem Pacific Coast Steel Corporation
San Francisco, California

This paper was presented at the Pacific Coast Regional Meeting of The Wire Association in San Francisco, Calif., on June 4, 1959.

When asked to participate in your program I expressed concern that the problems of the industrial fastener field might not be of general interest to the Wire Association and, further, that on the technical side of the subject, my talk might be lacking. However, processing wire to form bolts is similar in many respects to several wire applications and I was assured that kindred feeling would prevail, and since our industry is currently in the midst of changes so widespread they border on a revolution, our experience might be of value and interest as related to your own problems.

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The industrial fastener industry is in large measure a wire consuming industry. In fact, the trend to manufacture a larger and larger portion of our standard products from cold forging materials has accelerated in the past five to eight years to the extent that today almost all standard products 1" in diameter and smaller and 6" in length and shorter are produced by cold methods. The basic raw material for cold formed bolt products and most hexagon nuts is wire rod or coiled rounds. The size range of cold product is still expanding both in diameter and in length of product and one can visualize the time when very little hot forged material as we know it today will be available.

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The rapid expansion of cold forging, apart from the inherent manufacturing difficulties, has created widespread problems in almost every aspect of the marketing of our product. The standard industrial fastener field which includes the main products, bolts, cap screws and nuts, is today in a state of turmoil and change that is more profound and far-reaching in its effect than anything experienced in this industry in the past twenty years. Quality demands on standard product have materially up-graded the product, service and delivery problems are extreme, and concurrently the standard product itself is in a change-over period that has created a very difficult warehousing and stocking situation for every manufacturer and for every customer that maintains a sizable inventory. All of these factors of change can be traced directly or indirectly to the technical advancements in equipment and in particular to two primary classifications of production machinery, the boltmaker and the nut former.

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A somewhat surprising aspect of this picture is that the basic equipment has been available for twenty years or more, as early models of the boltmaker were introduced in 1929 or 1930 and the nut former in the early 30's. Yet, it was not until Post World War II, and really in the early 1950's, that the equipment was so perfected, the utilization so wide, the product knowledge so great, the nationwide communications and sales solicitation so developed, that the impact of the gradual changes taking place really became evident.

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Forming bolts by cold forging is certainly not a new art; as pointed out, the boltmaker itself dates from 1930. However, the complete impact of manufacturing changes is fully realized by analyzing the progression in methods from pre cold forming days to the present. Prior to the 30's, and into the early 40's, the automatic sizes of standard bolts were hot forged. In production, a preheated bar was sent into a heading machine to produce a blank with an overfilled head. After cooling, a separate trimming operation removed the forging flash. The product was then pointed and cut-threaded in automatic equipment to produce a finished product. As far as application and utilization of the product was concerned, it was generally good, but tolerances were comparatively large and finished appearance was not the best due to the manufacturing methods. Cold heading introduced the use of wire rod and resulted in an improved product, but maintained the same basic production steps where heading produced a blank which in separate operations was trimmed, pointed and threaded. Extrusion, as an innovation, allowed the use of roll threading methods to improve cost and also product, but still maintained the separate operations of heading, trimming, pointing and threading.

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The machine called the "boltmaker" combined all of these operations, so that pickled and limed wire rod fed through drawing dies to the input side of the machine, is headed, trimmed and extruded in four stations in the main part of the machine. The trimmed blank is transferred by tube to a pointing station and subsequently to a threading station to produce a completed product on the one machine. Control of dimensional tolerances is excellent. Appearance is excel-

lent, and through extrusion methods, the forging required to form the head is kept at a minimum, reducing upsetting problems.

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Obviously, equipment like the boltmaker has some drawbacks as well as limitations on flexibility and on types of product, where individual cold forging equipment may be better suited. Because of those limitations, a substantial portion of standard product is made and economically so by the individual machine processes outlined above. The boltmaker, however, does represent the ultimate in present equipment, when it can be used.

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The foregoing comments have described changes in the manufacture of standard bolts. At this point, I think it best to introduce a comment or two regarding the even greater changes that have taken place in a parallel fashion in the cap screw industry. Twenty-five years ago, most cap screws were produced by either completely machining a hot forged blank or by turning the body of the cap screw down from a drawn hexagon bar. Cold forging methods which were able to maintain the required close cap screw tolerances offered tremendous cost savings over those two methods. The cost savings passed on to consumers in the form of lower prices, developed volume markets in cap screws and fostered the progression into boltmaking equipment.

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To pause in review, two industries have been described; the bolt industry and the cap screw industry. To a large degree, they now use the same basic equipment, and to a large degree they produce products similar in appearance and physical tolerances, and to a large degree the products are utilized in similar fashion and distributed through the same channels. The culmination of similarity occurred about 1951 when dimensional tolerances of standard semi-finished hexagon bolts and of standard hexagon cap screws were made nearly equal. The conflict between marketing of cap screws and bolts has resulted in unstable conditions for the past several years.

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A similar progression in equipment can be outlined in the case of the machine called the "nut former" and its effect on standard nut products. The three steps of the changes in manufacturing methods are hot forging, cold punching, and finally nut forming. In the normal hot forging and also cold punching methods, a nut is punched from rectangular section, either a rectangular bar or coil. The resultant product is fully adequate from the standpoint of strength and application, but the finish and appearance are not the best due to shear marks and underbreak resulting from the punching process.

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Nut forming introduces wire rods to the manufacturer of nuts. Primarily used for hexagon nuts, the process offers substantial saving in cost and the product is superior in tolerances and finish to the normal product of either hot or cold punching. The major factor of cost saving results from the increased yield accomplished in forming a hexagon shape from a round, instead of punching a hexagon from a rectangle. In this process, the hexagon is expanded from the round by multiple piercing the center of the piece. Trimming the sides is not necessary and the scrap resulting from the punching to complete the bore is less than the slug alone punched from the center with punching processes.

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The progression just outlined concerns mainly the standard or common grades of nuts. However, the full impact of the nut former is not felt in just this field. Since a very fine surface results from the forming operation, it is possible to produce full finish or semi-finished nuts on this equipment as normal product without additional cost. As in the similar case of the small bolts and the boltmaker, this factor opens up an additional consideration, as prior to the advent of the nut former, finished and semi-finished nuts could only be produced by secondary machining of standard product or by machining the entire nut from a drawn bar. The nut former process offered cost savings so great that finished nuts could be sold at prices below those for the standard cold punched product. The result is that most volume requirements for nuts $\frac{5}{8}$ diameter and smaller now specify that finished hexagon product must be provided.

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These two progressions in the industrial fastener field had grown to the stage in early 1958 that hexagon bolts with finished hexagon nuts were adopted as the standard commodity for the packaged sizes through $\frac{5}{8}$ diameter, replacing square product in both bolt and nut that had been the industry standard for thirty years. At this date, the changeover is only partially completed and it is necessary at the present time for most manufacturers and some distributors to carry duplicate inventories to service the total requirement.

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The present situation might be termed a period of confusion. I say this because the standard commodity line is in a process of change and, in addition, both basic commodities, that is a bolt and a nut, can presently be purchased under two or three different names and in some cases at different prices. For example, in the small sizes of bolts a customer could order a hexagon head machine bolt, a bright cap screw, or a semi-finished hexagon bolt and would usually receive the same commodity. In hexagon nuts, the situation is the same, as in small sizes the identical nut would be provided by most manufacturers whether a customer ordered a cold punched, hot punched, or a finished hexagon nut. The future can only be one of simplification of nomenclature and product.

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The foregoing has outlined the effects in the industrial fastener field of two major classes of equipment which not only offered cost savings to manufacturers, but also made significant improvement in the appearance and dimensional tolerances of the products. The expansion of the use of this equipment and the resultant expansion of the improved product is continuing at an accelerated pace. Customer knowledge of the differences

(*Please turn to page* 1028)

Heat Treatment of Rod and Wire

by

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This paper was presented by Mr. Merrell at the Pacific Coast Regional Meeting of The Wire Association in San Francisco on June 4, 1959.

As most of you know, there is possible a wide range of physical properties attainable in wire products. For example, tensile strengths can be found in plain carbon steels from as low as 45,000 psi to values in excess of 300,000 psi. Three main variables can be controlled to obtain the particular physical property range desired. These variables include chemistry, heat treatment, and cold working which is normally called drafting. It is our intent in this paper to discuss the heat treatment of rod and wire, and more specifically, the heat treating facilities at the Pittsburg Works of Columbia-Geneva Steel Division. In our discussion we will review the various heat treating cycles employed at our Wire Mill, which include patenting, annealing, and stress relieving.

Patenting

Patenting is a preparatory heat treatment applied to high carbon rod or cold drawn wire in order to facilitate cold drawing and improve the uniformity of mechanical properties. Essentially, the process consists of heating the rod or wire to a temperature considerably above the upper critical and then cooling rapidly to a pre-determined temperature level. For certain applications patenting is required to refine the grain structure of the rod as delivered to the Wire Mill by the Morgan Rod Mill. It should be noted that patenting is not always required in rod form. For certain end uses involving relatively coarse wire sizes, patenting is not required; in other instances the green rod will be drawn to a process size which is then patented prior to further cold reduction.

* * *

Several methods of patenting are common in the wire industry today. These methods include: air patenting—also called Old Process or OP Patenting, lead patenting—called Metallic Hardening or MH Patenting, and electric resistance patenting. In each of these processes the temperature level is essentially the same. The rod or wire is heated to a chosen temperature between 1600 and 1900° F. with sufficient soak time to permit complete homogenization of the structure, that is solution of the carbides. In the air patenting methods, the heated strand (rod or wire) is cooled in air at comparatively rapid rates. In the lead patenting and electric resistance patenting processes the heated strand is quenched in a lead bath held at temperatures generally between 950 and 1050° F.

* * *

At Pittsburg Works there are three patenting processes. Two of the processes are accomplished on one patenting line, that is, one furnace is used for heating stock for either air or lead quenching. This furnace is an open gas chamber, 60 feet long, fired directly with natural gas through pre-mix type burners. The furnace is divided into three zones with gradient heating which delivers rod or wire at 1875° F. for air patenting and 1700° F. for lead patenting. No protective atmosphere is used. This unit normally covers a size range from 3/8" rod down to 11 gauge wire.

* * *

As stated earlier, in the air patenting process the strands of rod or wire are allowed to cool in air. During this rapid cooling a fine pearlitic grain structure is developed. During MH Patenting the heated strands are quenched in a lead bath, the temperature of which is carefully controlled by thermocouples. This lead bath at Pittsburg Works is normally operated in a temperature range of 975 to 1000° F. In rare instances, upward or downward adjustments are made to this temperature in order to obtain the desired physical properties.

* * *

Because the quenching action is more rapid in the lead patenting process, the microstructures are of a finer perlite than in the air patenting process. For a given chemistry and size, the tensile strength of the lead patented rod is normally 10,000 to 15,000 psi higher than for air patented steel.

* * *

The criteria for determining which patenting treatment is required include the end use of the drawn wire product, the size of the rod or wire being treated, and the limits of chemistry imposed by the specifications. Generally, for those

products requiring a fibrous structure, air patenting is specified. Where maximum toughness and esistance to bending fatigue are required, lead patenting is used. For the large sizes, coarser than 9/32", it is generally the practice to lead patent. Lead patenting is specified since the cooling rate at the center of the cross section of these large sizes may be too slow to develop the desired fine grain structure when air patenting is attempted.

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The second patenting furnace at Pittsburg Works is a recently installed AMH Patenting unit. This unit has essentially the same objectives as the MH Patenting process described above. In this radiant tube furnace, however, we utilize a protective atmosphere of nitrogen, carbon monoxide, and carbon dioxide in the muffle. The use of this atmosphere provides a wire whose finish, after the lead quench, is relatively free of scale and thus may be borax coated in lime, thereby eliminating the acid cleaning operation which is required on both the OP and MH Patented materials. The furnace proper is a radiant tube furnace, 33 feet long. It is divided into three zones with a total of 29 burners fired from both sides for uniformity of temperature control. At the present time, this frame handles only process wire and the speeds are adjusted to deliver to the lead bath a wire adequately soaked at 1700° F. As was the case in the MH Patenting process, the lead temperature is maintained at approximately 975° F. Here, too, the practice at Pittsburg Works normally utilizes a constant lead temperature; and adjustments are made to the lead temperature only during rare instances.

Annealing

Annealing consists of a heat treatment for the purpose of softening wire by relieving the hardening effects of cold drawing. It may be done as a final operation or as an in-process treatment designed to permit further cold reduction. In the wire industry several methods are available; these include pot annealing, lead annealing, salt annealing, and furnace annealing. The three practices employed at Pittsburg Works include lead annealing, pot annealing, and furnace annealing. Lead annealing is generally used in conjunction with the galvanizing process; however, it may be specified as a final operation on uncoated wire preparatory to shipment to customers or to some final conversion treatment such as rewinding. Metallurgically, lead annealing consists of a sub-critical strand treatment which is achieved by passing the wire through molten lead maintained between 1250 and 1300° F., followed by air cooling. The short time cycle at these temperatures does not take the carbon into solution but rather removes the major effects of prior cold work by relieving the distorted ferritic grain structure. The net effect is an improvement in elongation properties with an attendant reduction in tensile strength. The degree of softness attained in this process is significantly less than in furnace or pot annealed wire. However, the added stiffness of lead annealed wire is a desirable feature in many end uses which require a slightly higher yield strength than is found in furnace or pot annealed wire.

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Furnace and/or pot annealing practices differ from lead annealing in that these are long cycle treatments in which not only the ferrite grains but also the carbide particles are equiaxed. This practice generally requires a relatively slow cooling cycle. At Pittsburg, pot annealing is confined primarily to process wire and/or black annealed Merchant Quality wire. The temperatures are approximately 1250° F. with the total cycle time of approximately eight hours for a charge of 4500 pounds. No atmosphere is used during pot annealing; however, the pots are sealed to prevent air infiltration.

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Furnace annealing is accomplished in Lee Wilson single stack bell type furnaces, automatically controlled by thermocouples. A protective atmosphere composed essentially of nitrogen and hydrogen is used. This protective atmosphere prevents surface oxidation and minimizes decarburization.

When maximum softness is desired, as required for Recessed Head Screw wire on Extruded Tubular Rivet wire, a special spheroidize-anneal cycle is employed. This cycle derives its name from spheroidal carbides which are developed from the longer soak, the slower cool and refined temperature control specified. The spheroidal shape and the wide dispersion of the carbides facilitates the flow of metal in severe forming operations.

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The availability of refined temperature control and the protective atmosphere permit a variety of finishes to be obtained in the Lee Wilson furnaces. These finishes range from bright to black and are obtained by adjustments to the uncapping temperature. For example, a black annealed finish will be obtained by uncapping at temperatures approximating 1000° F., whereas a bright annealed finish requires delayed uncapping at a temperature of approximately 300° F. Depending on the ultimate end use and the finish of annealed wire, acid cleaning may or may not be required for subsequent processing in the Wire Mill or in the customer's plant.

Stress Relieving

Stress relieving in the manufacture of wire and strand is not to be confused with stress relieving as it is commonly understood in the post treatment of welds, castings, and heat treated parts. The use of stress relieving cycles in the wire producing facilities are generally limited to the manufacturing practices for strand and/or wire for selected pre-stressed concrete end uses. Specifically, stress relieving is designed to improve elastic properties, that is, to raise the Proportional Elastic Limit. In this sense, the aim of stress relieving is closely related to that of tempering in the manufacture of springs. Tempering of coil springs is employed to improve compression under load characteristics, or in other words, to minimize permanent set. For the manufacture of pre-

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The Shipping and Storage of Wire and Wire Products

by L. J. Welsh, Superintendent
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Oakland, California

A paper presented at the Pacific Coast Regional Meeting of The Wire Association on June 4, 1959, in San Francisco, California.

As an introduction to the shipping and storage of wire and wire products, I would like to review briefly the reason for this subject's importance to the wire industry as a whole. It was not too long ago, in fact, a very few years ago, that our customers ordered their wire by gauge and kind. Today that has changed drastically. Their orders specify coil size, container, packaging, markings, in addition to type and size. No longer is wire thought of as just a coil of wire. We must supply our customer what he needs — offering no substitutes in the package of wire. The industry as a whole has made rapid strides after a very late start. This progress has been necessitated by the increased costs of labor and handling from the shipping dock to the machine using the wire. Until recently, the customer accepted a coil of wire as the only way it could be made. He realized that there would be savings in his machine utilization by fewer stops for placing a coil of wire at the feed-in of his equipment. He asked a very simple question—"Why not a larger coil or spool of wire?" And by his demands, and the demands of our own manufacturing facilities for fabricated wire products, the many new packages of wire we now use every day in our industry came about. The customers' demands for improved packaging of finished products has had the same effect on the fabricated wire products we produce.

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Before presenting some of the material handling, storage, and shipping methods used with our products, I wish to describe the main operations of the two plants of C F & I's Pacific Coast Division. Our operations at the South San Francisco Mill are wire producing. The factory in Oakland is a weaving plant. The Wire Mill supplys, in addition to our customer's needs, all of the Oakland Factory wire requirements, with a few exceptions. These two plants are located approximately twenty-five miles apart. You can see that the distance between these two producing units creates a supply problem, in addition to a storage problem in the Oakland operations— it takes time to package and move raw material that distance. Some of the methods now used in packaging of wire have been developed from the needs of our Oakland operations. The following will point out a few of the ways in which our Wire Mill packaging methods have helped our Oakland operation.

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At our weaving plant in Oakland, we produce wire cloth in a range that includes fine filter cloth to heavy rock screens. In this range are items of hardware cloth, burner cloth, and industrial cloth that are used in the manufacture of many finished products; in addition to Realock Fence, Cal-Tie Wire, Mechanics Wire, Straightened and Cut Wire, and Soffit Screen. In the production of these products several types of packaged wire are necessary for the economical and efficient utilization of our producing equipment. Our looms are divided into several categories. One group produces cloth made from high carbon wire, which requires precrimp construction in both the warp and the fill. A large quantity of this material is made up to customers' specifications, both in spacing and over-all dimension, which precludes the maintaining of stocks and full machine loading. The stock items, with few exceptions in this department, are not of the nature that would be considered long run items, so there is very little to be gained in the special packaging of the raw material other than in containers for shipping and storage. Due to this wide range in our customers' needs it is necessary to keep a complete inventory of high carbon wire from 9/16″ diameter down to 20 gauge. The quantity stocked is limited to one ton to five tons, based on our past usage. To accommodate this condition our Wire Mill loads this wire in steel racks designed for forklift and truck shipment. The loading is done either at the drawing bench or the wire tying department. These steel racks have a capacity of three to four-thousand pounds of tied wire. They can be high-piled in the storage area—three to four high. The Oakland Factory draws from this inventory as needed. Loads of twenty tons are shipped by truck as produced and accumulated at the Mill.

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In the crimp department there are two unique methods of preparing the crimp wire for the warp. In one method the cloth is ordered and stocked in two to ten-thousand foot lots, which presents a problem in loom loading. For products in this range of specifications we precrimp two to three-thousand feet of warp by reeling the crimp wire on large spools direct from the crimping machine — several wires at a time. This enables us to reduce the repetition of loading and effects a manhour saving at that point. For loads up to three-hundred feet,

a conveyor is used which carries several wires from the crimper and automatically stops at the prescribed length desired. In the other method the case is reversed. The hardware cloth department productive output is concentrated on six different mesh specifications, with an output of several thousand rolls per month. Looms are warped up for long runs on a particular mesh and wire size, and only changes in width are necessary. The warp wires are continuous. This is accomplished by placing spools on a rack in back of the loom. The Wire Mill supplies these spools in the type and finish of wire needed, by spooling on the drawing machine in our Wire Mill. The spools are then put in containers at the machine that completes the last process, and then shipped to our Oakland Plant with no further handling. The Realock fence weaving machines are fed from wire on stem-paks. These are metal based wire frames loaded with approximately one-thousand pounds of wire. They are loaded directly at the drawing bench, taken off by a high riding stripper, tied down at that point, and sent to the Wire Mill shipping room. They are handled by forklift on and off the truck transporting them, and by the same method from the storage area to the machine. All these empty containers, racks, and stem-paks are returned to the Wire Mill for reloading.

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The storage and shipping of the finished material in the Oakland shipping department presents a variety of problems. These products arrive at the shipping dock in all sizes and shapes. Hardware cloth is palletized at the end of the galvanizing line. For this, a disposable pallet of a standard size that is suitable for storage and shipping is used. The number of rolls on the pallet is determined by the diameter and weight of the cloth. Metal strapping is used for safe and damage-free handling of these rolls. For some shipments corner boards are used on the top perimeter, and strapped vertically to bind the load in that direction. Fine grades of industrial cloth are packaged in fibre board tubular containers, labeled and palletized at the inspection department. Most of this type of material is shipped in individual rolls, necessitating this type of packaging. Cal-Tie wire is cartoned in forty and eighty pound packages, palletized at the producing machines on a disposable pallet. The shipping department will further metal strap and corner board these loads as the destination demands. Heavy industrial cloth is normally ordered in finished pieces, cut and formed to the customer's specifications. Hooked edges are protected by triangle wood strips — the pieces are then metal strapped and bundled for shipping. Stock items in these specifications are stored in twenty-four foot flat sheets in horizontal steel racks. Orders are then cut as needed. Wire cloth of finer specification is fully crated to further protect from damage. All packaged items are palletized for storage and shipped that way—where the order quantity permits. Pallets are also used to store general purpose fabric. We have large movements of our Oakland products to our five Pacific Coast District Warehouses, and we attempt in every way to package our products in a manner that will permit good storage in these warehouses.

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From the customer's standpoint, we are finding more and more pressure exerted to improve the ways in which these products are shipped, both as to appearance and prevention of loss due to damage in transit. The Wire Mill has had to make the more drastic changes in the shipping and packaging processes due to its being a raw material supplier to our customers. These customers have grown up rapidly in the last few years, many from small plants employing a few men to present day large production units employing many. They are using modern and costly high speed equipment. Their machines, to give their owner a profit, must run as continuously as possible. Downtime must be minimized. Raw material quantities which formerly would be adequate for daily or weekly production requirements now are being consumed on an hourly basis. We have worked and are working with our customers continuously to improve their production. Many special types of packages have been developed, by us and other manufacturers, that are in common use today. One type of package that is very common is the stem-pak. This is similar to the one we now use in our Realock Department in Oakland, with the exception that it has a wooden base and is made in two sizes to accommodate 16″ or 22″ coils. These are loaded by packaging the pay-off at the producing machine, or from a high riding stripper or dead block, then tied down, tagged, and shipped. They are non-returnable. Galvanized wire and other types are packaged in this manner at the galvanizing take-up by individual packaging machines. Specialty wires are put up in half-paks or full-paks containing from three-hundred to eight-hundred pounds. This type of package lends itself very well to storage and with a few core modifications as requested by the customer, can be used as a pay-off for his machines. They can be shipped singularly or on disposable pallets. All baler wire is palletized on disposable pallets, thirty-six cartons strapped in a package. The coil of wire is still prevalent, but it has a new look — it's larger. Tying and strapping, and paper wrapping machines are now available or are being designed to assist in preparing coils much greater in weight than at present; in addition high riding strippers adapted to our drawing equipment all work toward the one goal of giving the customer more productivity on his machines.

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All of these improvements can be nullified by careless handling. We may develop the increased size of the coil of wire, only to damage it in shipping. The larger the coil the more cost lost in damage. The preparation of products for shipping is a non-producing operation having an extreme effect on costs. Labor, packaging, and shipping costs continue to rise. This necessitates careful and continuous study of shipping and storage operations, with the objective of maintaining low costs in the face of these rising labor and handling costs. Industrial Engineers should be utilized in this study. They can

(*Please turn to page* 1030)

Heat Treating of Finished Wire and Wire Products

by G. B. Berlien

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Oakland, California

This paper was presented at the Pacific Coast Regional Meeting of The Wire Association in San Francisco, California, on June 4, 1959.

The composition of Materials for Heat Treatable Springs has a wide range of possibilities. The carbon content is first of all of utmost importance. SAE grades of straight carbon will range from 1045-1095. Alloy steels for heavy springs will range as follows: SAE 6150 - NE 8650 and SAE 9260. With the above range a major tonnage of ferrous springs can be fabricated.

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The heat treatment of the straight carbon grades will involve heating above the critical temperature followed by an appropriate quench. Such heating should be accomplished in furnaces provided with a suitable atmosphere to prevent decarburization which results in early fatigue failure. The most popular atmosphere today is the endothermic type. The composition of this gas is proximately 40% hydrogen and 20% carbonmonoxide with the balance being nitrogen.

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The subject of atmosphere control is a field of its own. The use of the endothermic gas necessitates a fully muffled gas furnace or an electric furnace in order to avoid dilution of the atmosphere by air. Scaling is likewise eliminated avoiding less of size or thickness of very thin materials.

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The low fatigue life resulting from a decarburized surface is readily explained when one examined the tensile and yield properties of steel in the .10-.20 carbon range. A decarburized spring is a composite material, the core having high yield properties will allow a spring to function. However the surface material cannot accommodate repeated stresses without rupture and thus early fatigue failure results.

The temperature used for quenching will range from 1450 F. for SAE 1090 to 1550 F. for SAE 1045. The time required at heat need only be sufficient to bring the parts to a uniform temperature after which quenching should immediately follow.

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The quenching operation must perform two services. First — the quenching rate must be sufficiently rapid to develop maximum hardness for the steel employed. This will range from 58 RC to 66 RC depending on the amount of carbon present. Secondly—the quenching operation must introduce the least possible stress to avoid deformation.

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An oil quench is commonly used for springs that are not critical in design. Springs formed of light wire or flat stock may be hardened by the martempering or austempering procedure. The martempering quench employs the use of a salt bath operating at approximately 400 F. Thus springs will be heated at the prescribed hardening temperature followed by an immediate quench into the salt bath and remaining there only until the 400 degree temperature has been reached. The parts will then be removed and allowed to be air cooled to room temperature. Maximum or full hardness will result.

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The austempering process involves quenching in the temperature range of 500 F. - 750 F. The selection of an appropriate temperature for the quenching medium is determined by the desired resulting hardness. The reason for this is the fact that austempering is an isothermal operation which incorporates both hardening and tempering. The lower temperatures used in austempering of 500 F. or slightly above will provide the highest hardness. As we increase the austempering temperature hardness becomes progressively lower. A time cycle must be incorporated with this type of quenching to allow the isothermal reaction to take place. This time will be from 5 to 15 minutes with the higher temperature requiring the shortest time. The parts are then removed from the quench and allowed to air cool after which they are washed and are ready for service.

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Oil quenching and martempering must be followed by conventional drawing. Temperatures employed are from 550 F. to 900 F. depending on hardness requirements. Time cycle in commercial use ranges from 30 minutes to two hours depending on cross sectional areas.

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Heavy coil and flat springs with section size 3/8 inch or more are generally made from alloyed materials such as the 6150 - 8650 - 9260. An oil quench is employed with these materials not only for convenience but to provide maximum hardness prior to tempering. Hardening temperatures will range from 1525 to 1600 F. Tempering will require temperatures from 600 to 900 F. As a general rule hardness values of 380 to 444 Brinell are required.

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Prestressing of heat treated springs by shot peening increases

(*Please turn to page* 1030)

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Plating of Wire and Wire Products
The Kanigen Process

by Donald E. Stewart
Industrial Kanigen Corporation
Emeryville, California

A paper presented by the author at the West Coast Regional Meeting of The Wire Association in San Francisco, California, on June 4, 1959.

The Kanigen process, a chemical nickel-phosphorous plating, is a unique field of plating which has many applications in the wire and wire products industries.

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Generally when one speaks of plating, one thinks of electroplating, which is the use of electrical current to deposit a metal coating from a solution of metal ions onto a base metal. Plating can be achieved by three other means:

1. **Vacuum plating—vaporizing a metal in a vacuum which is then condensed on the piece to be plated.**
2. **Immersion plating—the replacement of an atomic layer of a metal by a solution of metal ions of a more noble metal to form an immersion layer.**
3. **Chemical plating—where a chemical provides the force to deposit a metallic ion from solution.**

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The Kanigen process is the most widely used process of chemical plating.

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In the word "Kanigen" KA stands for catalytic (the German spelling) NI for nickel, and GEN for regenerated. Kanigen was developed by the General American Transportation Corporation using the basic research on chemical nickel-phosphorous produced at the Bureau of Standards beginning in 1946. Developed originally for lining tank cars with corrosion resistant nickel, the use of the Kanigen process has increased rapidly in the past nine years.

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The reaction is the reduction of nickel ions in a water solution by sodium hypophosphite in the presence of buffering, complexing and wetting agents. The bath temperature is maintained between 195 and 210°F. Regeneration solutions are constantly added to maintain the chemical concentrations and pH to give constant plating rates. The work pieces are agitated to improve plating rates and surface appearance.

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Some of the more unique properties of Kanigen are its:

1. **Chemical analysis.**
2. **Structure and the variation produced by heat treatment in the properties of hardness, ductility, abrasion resistance and frictional properties.**
3. **Corrosion resistance.**
4. **Adhesion.**
5. **Closely controlled deposition.**
6. **Surface appearance.**
7. **Ability to plate various basic metals.**
8. **Special properties of solderability, bonding to rubber and as a heat treating maskant.**

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The chemical analysis of Kanigen is 90-92% nickel, 8-10% phosphorous and small amounts of carbon, oxygen, nitrogen and hydrogen. The specific gravity is 7.9. It is a conductive coating having a resistivity about nine times pure nickel and thirty times copper.

★ ★ ★

One of its most unique properties is its structure and the effect of heat treatment. Kanigen coatings as deposited, have the structure of an undercooled liquid having an amorphous structure, and no detectable crystal structure. This accounts for Kanigen's lack of porosity. Unlike electrodeposits, the coating is unaffected by the crystal structure of the base metal. The reaction of the Kanigen deposition is an almost instantaneous one starting from point sources on the base metal which acts as a catalyst for the reaction. Once started, the Kanigen itself acts as a catalyst. The coating as deposited has a hardness of 49 Rockwell C or 500 Vickers, hardness number measured with a Diamond Pyramid. By heating to 750°F. hardness values of 69 Rockwell C and 1000 Vickers can be obtained. This hardness increase is explained by the gradual formation of a nickel phosphide precipitate in a nickel-phosphorous lattice. Increased heat treatment induces the formation of a more ordered lattice and as a result, the hardness values decrease to the range of the values as deposited—49 Rockwell C. Heat treatment increases the ductility, abrasion, frictional properties and corrosion resistance as well as the hardness. Ductility, which is low, as might be expected from the hardness, can be increased. Kanigen as deposited will support 2.2% total strain before surface cracking and a 6% total strain when heat treated to 750°F. For this reason Kanigen cannot be applied successfully to wire and wire products with extreme flex. However, it has been successfully applied to springs with limited travel for use in regulators and meters.

★ ★ ★

Air Force tests have indicated that Kanigen against streel or against itself has abrasion properties approaching those of hard chrome when heat treated to 750°F. and above. Specimens heat treated above 1200°F. actually exceed the abrasion resistance of hard chrome. In one abrasive application, Kanigen coated aluminum guide bars on a cleansing powder filling machine, held up well where electroplate failed almost immediately. In another application, Kanigen lasted thirty times longer

(*Please turn to page* 1013)

WIRE and WIRE PRODUCTS

reaches many prospects

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WIRE AND WIRE PRODUCTS circulation is all paid. We have no agents, offer no premiums or make special inducements to get circulation, except the value of the editorial contents in itself—yet our renewals have averaged 97% or better for many years. That's why it is a good and forceful advertising medium for all concerns who have products to sell to this vigorous and progressive industry.

Subscribers by Types of Mills in the Industry

1. Rod, Bar and Wire (producers of rod, bar and wire in all metals and shapes)	38%
2. Forming and Fabricating Plants (mfrs., largely from purchased wire, of springs, wire cloth, bolts, nuts, screws, rivets, wire forms, fences and fencing, wire specialties, wire rope and electric wire and cable)	59%
3. Miscellaneous—Libraries, Research Organizations, Jobbers, Distributors, etc.	3%

Subscribers by Types of Positions Held

1. Executives: Presidents, Vice Presidents, Secretary-Treasurers, Purchasing Agents, Sales Managers	22%
2. Operating: Vice Presidents, General Managers, Works Managers, Superintendents and Assistant Superintendents	58%
3. Research and Maintenance: Plant Engineers, Metallurgists, Laboratory Technicians, Foremen and Inspectors	19%
4. Libraries	1%

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WIRE and WIRE PRODUCTS

453 MAIN STREET • STAMFORD, CONN.

Spring Wire

by R. W. Dobbins
Purchasing Agent
Simmons Company
San Francisco, California

A paper presented at the West Coast Regional Meeting of The Wire Association in San Francisco, Calif., on June 4, 1959.

I. Introduction

The committee handling the program for this Regional Meeting of The Wire Association had the idea that it would be interesting to hear from one of the users of wire as well as the makers of wire.

★ ★ ★

Because of the volume consumed and the variety of sizes and types used, the Simmons Company was selected to represent the users of Spring Wire. And I was in turn selected to present this portion of the program.

★ ★ ★

So, now that you have stayed this far through the program, you may just as well stay for this part too; and I will try to be as brief as possible for this concluding part so that we can adjourn for the afternoon.

★ ★ ★

In the limited time allowed me, I will present to you some of the things that we do with this Spring Wire, after you at the Mills make it for us.

★ ★ ★

We will cover the highlights only of: Handling and Storage, Types Used, Classifications of these types, Uses, Quality Control, and some of the common problems to be on the alert for in all of these phases.

II. Spring Wire—Handling and Storage

A. Unloading — Naturally we must unload wire in the reverse order in which it was loaded at the Mill. A few years ago we requested the Mills to "ram-load" our cars, which was a change from the old system of "nesting" the coils in the car. Under the old system it took a crew of two handlers plus a fork lift driver about three-quarters of a day, or approximately eighteen man-hours, to unload a car. Now we do the same unloading job with one fork lift driver in approximately two hours, equipped with a ram on the lift. The result of close cooperation between manufacturer and user, as you can see, is a saving of sixteen man-hours per car, or around $32.00. With our volume this is a savings of approximately $500.00 per month.

★ ★ ★

B. Storage — As this fork lift driver brings the wire out of the car, he drops these coils into steel angle-iron storage racks. Each of these racks is so designed that the coils will stand on edge — as they did while in transit in the car. This is a three sided rack, with one open side, so that the coils can easily be rolled out of this rack after the rack of wire has been delivered to fabricating machines. These racks are also raised about eight inches from the floor so that they can be easily lifted and hauled with a fork truck or electric transporter. The top frame of these racks, that is the three sides, are made of angle iron so that the bottom of another rack can slide into this angle section and thereby prevent slippage when one rack is stacked on top of another. We usually stack these racks four high; these racks will hold around a ton of wire so we can store four tons in an area of floor space three feet by four feet.

★ ★ ★

Before these racks of wire are stacked away in storage, each rack is "fog-sprayed" with a very light penetrating type of oil as a precaution against rust. Rust is one of our constant battles which is aggravated by our close proximity to the Bay. This brings us an average of about 18% moisture content in the air plus drastic temperature changes.

★ ★ ★

Also, before storing this wire away, we assign a lot number to each size received in each car. Tags are attached to the wire racks indicating the lot number, gauge, number of coils in the shipment, and the total weight. By later using these lots in numerical order it assures us of proper rotation of the wire and helps minimize the rust problem.

★ ★ ★

C. Delivery to Production Departments—Each afternoon every department supervisor furnishes our Stores Department with requisions for his following days requirements. One rack or approximately a ton is usually the minimum delivered even on very slow moving items. These requirements are delivered to the operating departments via fork lift, usually two racks per trip stacked one on top of the other. When the fork lift arrives in the "wire area" of the department, these racks are set singly on the floor. From there they are delivered by electric hand transporter to each coiler or fabricating machine. Thereby, each machine operator always has a rack of wire at his machine within reach of his hand operated electric hoist so that he can lift the coils into the reels on the machine.

★ ★ ★

D. Types of Wire Used—We use both high and low carbon wire in quite a variety of sizes. We range all the way from #00 gauge to 18 gauge which, as most of you know,

(*Please turn to page* 1011)

The West Coast Regional Meeting of The Wire Association

San Francisco played host to our members this year. The Regional Meeting, held at the Fairmont Hotel on June 4 and 5, 1959, got off to a good start on Thursday morning, when the registration desk opened at 10 o'clock.

★ ★ ★

One hundred and fifty people registered during the course of the two-day meeting, which well-justified all the work that the Program Committee put into its preparation.

The Technical Session

This part of the meeting began at 1:30 P.M., with V. A. Barbata of Bethlehem Pacific Coast Steel Corp. and R. W. Payne, Columbia-Geneva Steel Div., U.S. Steel Corp., serving as moderators.

★ ★ ★

The opening presentation was made by J. L. Humphrey of Bethlehem Pacific Coast Steel Corporation, whose paper was concerned with "Impact of Equipment in the Industrial Fastener Field."

★ ★ ★

Richard T. Merrell, E. F. Fredrick and G. R. Decker of the Columbia-Geneva Steel Division of the United States Steel Corporation were the joint authors of another paper, presented by Mr. Merrell, on the "Heat Treatment of Rod and Wire."

★ ★ ★

"The Shipping and Storage of Wire and Wire Products" was the subject of a paper given by L. J. Welsh of the Colorado Fuel & Iron Corporation.

★ ★ ★

The fourth paper also was devoted to heat treating, but whereas Mr. Merrell's outlined the mill man's point of view, this was one covering the subject from the independent heat-treater's standpoint. It was delivered by Ben Berlein of the Industrial Steel Treating Company in Oakland. The paper was entitled "Heat Treating of Finished Wire and Wire Products."

Don Stewart of the Industrial Hard Chrome Company, also of Oakland, then gave a paper on "Plating of Wire and Wire Products—The Kanigen Process."

★ ★ ★

The final paper of this full session was on "Spring Wire." Ward Dobbins of the Simmon Company discussed various types of wire for industrial, bedding, upholstery and other springs in it.

★ ★ ★

The meeting concluded with the showing of a fine sound-color movie called "Holding Power," portraying the production of cold headed products. It was shown through the courtesy of the Bethlehem Pacific Coast Steel Corporation.

The Plant Inspection Tour

Busses left the Fairmont at 9:30 A.M. on Friday, June 5, for a visit to the South San Francisco plant of the Colorado Fuel & Iron Corporation. Approximately one hundred men took in the tour.

★ ★ ★

The trip through the wire mill was well-managed and proved to be of great interest to CF&I's wire industry visitors. The company has modernized and expanded many of its facilities in the last few years, giving those who had not been there before much to see.

★ ★ ★

At noontime the members of the group were the guests of the Colorado Fuel & Iron Corporation, who provided a very satisfactory luncheon at the International Inn at South San Francisco.

★ ★ ★

Following the conclusion of the tour, the men were returned to the Fairmont via the longer, but much more spectacular, scenic ocean route—an "extra" that was greatly enjoyed and appreciated, thanks to the thoughtfulness of the Program Committee.

The Dinner

A hospitality Hour, provided through the courtesy of a number of suppliers, was held from 6:30 to 7:30 P.M. The music was provided by Jeff Crum of R. H. Miller Company, of Homer, New York.

★ ★ ★

The dining room doors opened at seven-thirty o'clock. Tickets for the dinner contained a stub for door prizes, the stub being deposited upon going into the room. Following the dinner the prizes were distributed by drawing. The donors of the door prizes were:

Metro Products, Culver City, Calif.

Stauffer Chemical Company, San Francisco, Calif.

Lee Wilson Engineering Company, Cleveland, Ohio

Abco Wire and Metal Products, Hayward, Calif.

K. H. Davis Wire and Cable, Los Angeles, Calif.

Industrial Wire Products Corporation, Los Angeles, Calif.

Morgan Construction Company, Worcester, Mass.

No Sag Spring Company, Redwood City, Calif.

Planett Manufacturing Company, Downey, Calif.

Flynn & Enslow, San Francisco, Calif.

Southwest Steel Rolling Mills, Los Angeles, Calif.

Nichols Wire & Aluminum, Oakland, Calif.

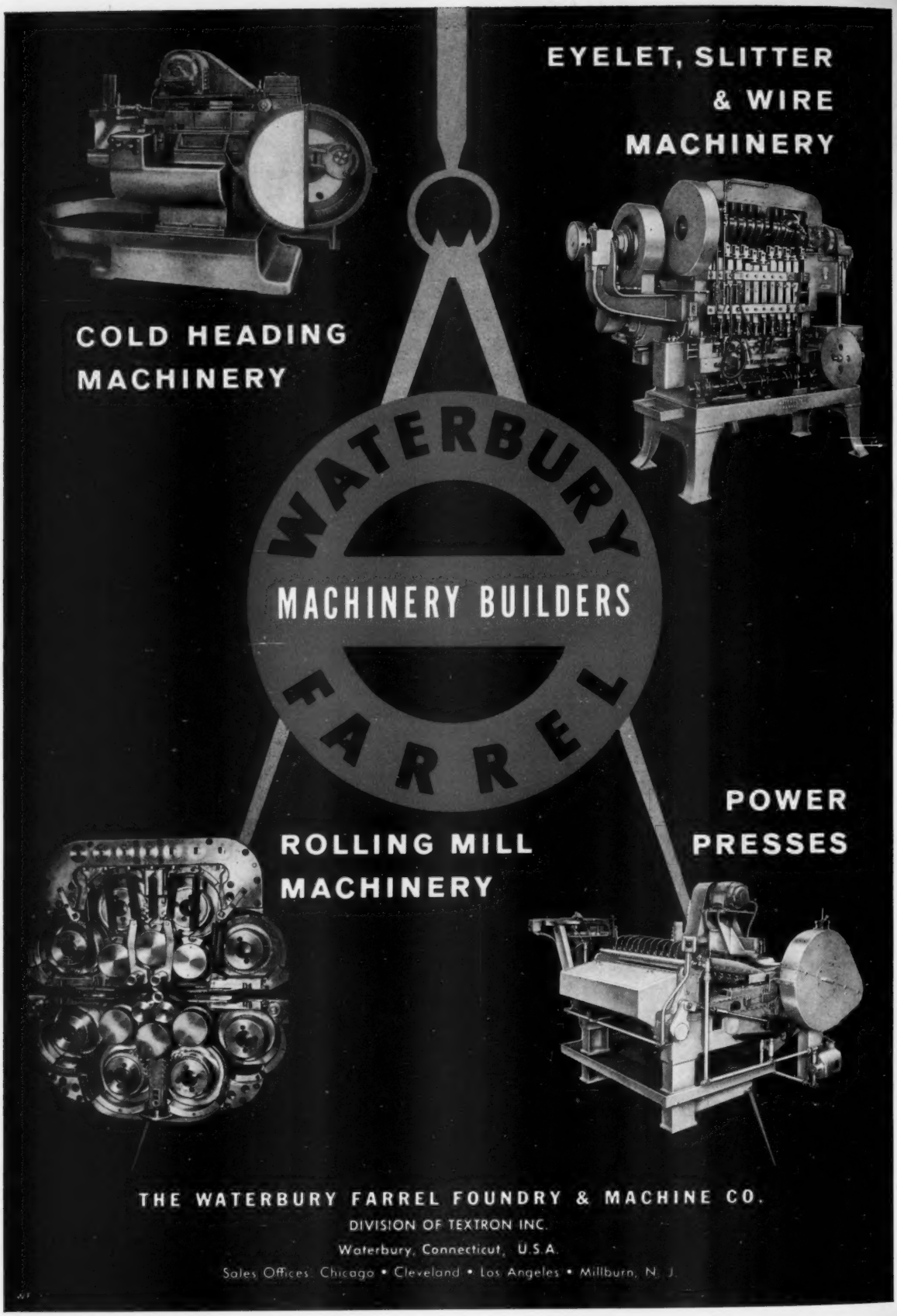
★ ★ ★

The after-dinner speaker was **Dale H. Hutchinson** of the Stanford Research Institute at Palo Alto, California, who addressed the gathering on "Space Research," a topic on which he was well-qualified to speak by virtue of his work on this new phase of cosmology into which world thinking is being projected.

The Program Committee

Responsible for the successful outcome of the 1959 West Coast

(*Please turn to page* 1015)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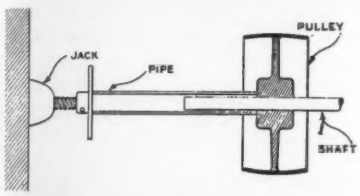
Wire Kinks

A Way to Push a Gear, Pulley, Sheave, Bearing, Etc., Onto Or Off of a Shaft

Among your tools you very likely have a screw jack — or some other kind of jack. If you own an automobile a jack surely came with it. Also, you probably own an assortment of metal pipes. That being the case you are all set up for doing a wide range of forcing jobs such as forcing sheaves, bearings, gears, pulleys, etc. onto or off of shafts.

★ ★ ★

This sketch shows how easy it is



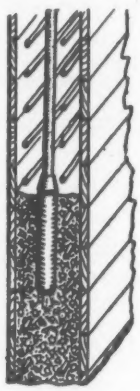
to take care of a job of this kind by means of a screw jack and ordinary standard pipe. It is so simple that further words are deemed unnecessary. The sketch tells the entire story.

How to Pack Material in Difficult Locations

Boiler walls, baffle walls, building walls, etc., should always be solid when completed. Owing to reinforcing rods and small distance between forms, however, difficulty is often experienced in doing the packing because the workman "can't get at" the material with an ordinary type of tamper.

★ ★ ★

Such problems can often be solved by means of an interesting and valuable "spade that shimmies" as illustrated herewith. This



so-called "spade" is on the end of a flexible hose or shaft, and the spade is made with its center of gravity off-center. In other words, the center of gravity is eccentric. As a result, when the spade is whirled it shimmies, and the shimmying causes the material to pack.

Do you have how-to-do-it items for this department? To make it a success we are depending on readers to send us material drawn from their own experience and observation. Your cooperation will be appreciated by us and our many readers.

The Strength of Nuts

With a hard, heat treated nut, ability to plastically adjust and distribute load over many threads diminishes. High loads tend to concentrate on first thread severely enough to cause stripping . . . or fracture of first thread, which causes locking. Nut then cannot increase tension in bolt.

★ ★ ★

Untreated nuts are strong enough for most needs, and don't pose this problem.

Upon tightening, a nut both compresses, and dilates. Dilation can be overcome by wall thickness only, not by added height or heat treatment.

★ ★ ★

Dilation is important since a reduction in area of bolt under tension accompanies it. Threads pull away from each other, from their stronger base to weaker tips. The shallowness of **fine** threads can cause progressive shear.

★ ★ ★

That's why High Nuts (with fine threads) are no answer where "Heavy" Nuts (with course threads) are.

★ ★ ★

Rotation of nut produces both tension and torsion in bolt. The force applying this combined stress is about 20% greater than the load which must be sustained when rotation stops.

★ ★ ★

Thus . . . if a nut hasn't failed in wrenching, it can still withstand at least 20% more direct pull than it sustained during the tightening.

-Courtesy of Russell, Burdsall & Ward Bolt and Nut Co., Portchester, N. Y.

To Loosen that Rusted, "Frozen" Nut—Just Submerge It in Oil

Sometimes you can't unscrew a nut because it is badly rusted. You try to oil it, but the oil runs off. The accompanying sketch shows how to create a small "tank" of oil on top of the nut. In this way you can give the rusted threads a thorough soaking.

★ ★ ★

THE ELECTRIC WIRE & CABLE SECTION OF

THE WIRE ASSOCIATION

This section, devoted to the interests of production men and engineers concerned with production problems, will be responsible for the program of technical papers presented at the Annual Convention of the Association, to be held in Cleveland, Ohio, at the Statler-Hilton Hotel, October 12-15, 1959. Members work closely with the Program Committee in securing and clearing papers submitted for presentation.

All electric wire and cable men are cordially invited to attend the Convention. If you do not belong to the Association, write for a hotel reservation card. It will be sent promptly.

The Committee

The Men who comprise the Electric Wire and Cable Committee are:

Clement C. Lawson (Chairman)
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Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

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Hazelton, Pa.

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Kaiser Aluminum & Chemical Corp.
P. O. Box 671, Newark, Ohio

Roger T. Stafford, Project Engineer
Kennecott Wire & Cable Co.
Phillipsdale (Rumford 16), R. I.

Marshall V. Yokelson, Chief Met.
General Cable Corp.
Bayonne, N. J.

We hope you can be with us in October.

THE WIRE ASSOCIATION

RICHARD E. BROWN, *Executive Secretary*

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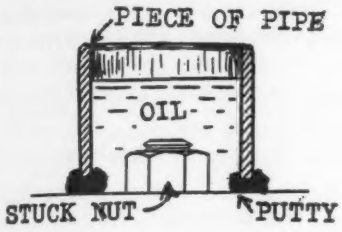
Wire Kinks

As indicated a piece of pipe serves as the oil reservoir. A ring



of putty or modeling clay can be made to serve as a seal between the pipe and the lower surface so that the oil won't leak out. In fact, if you have no piece of pipe, and if you have enough putty or clay, you can make the reservoir entirely of the putty or clay, without the pipe. The important thing is: submerge the nut in the oil.

Facts Concerning Poor Packing

While inspecting a plant recently an example of a badly scored shaft due to the use of a poor packing was noted. On investigation it was found that the type of packing that had been used is all right as long as it is kept well lubricated. But in that type of packing as soon as lubrication fails and the packing dries it begins to wear and even to cut the shaft or rod just as in the example already cited.

★ ★ ★

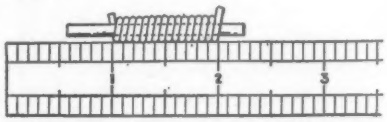
It therefore is well to give this point careful consideration before selecting any packing for an important stuffing box. Be sure that, even when dry, the packing will not have a tendency to cut. In the "old days" packings were made tight in order to prevent leakage, and in many instances they are still being made too tight. As a result the power loss even for small packed stuffing boxes commonly amounts to one-half of one horse power, and even more. Operating the machine under such adverse conditions can therefore easily cost $5 or $10 in a few months for power alone on account of the extra fuel required, and then at the end of that time the operator may find that he must either have his shaft or rod turned down smooth again, which will cost several more dollars, or, he will be obliged to buy a new shaft or rod.

★ ★ ★

Poor packings are expensive. Don't use them.

How to Measure the Diameter of a Small Wire Without A Micrometer

This sketch shows how easy it is to measure the diameter of a small wire with an ordinary scale or ruler.



Wind the wire on a round rod or stick, as shown, so that all of the wire turns make contact throughout. That is, there must not be any gaps between the turns.

★ ★ ★

Count the number of turns per inch and divide into one. Thus if there are 16 turns per inch as shown in this sketch we have — 1 divided by 16 equals one-sixteenth, or, 0.0625", which is the diameter of the wire. If there are 50 turns per inch we have — 1 divided by 50 equals 0.02". If there are 80 turns — 1 divided by 80, or, 0.125".

★ ★ ★

And so on. It is a surprisingly accurate as well as simple way in which to measure the diameter of a small wire without the aid of a micrometer.

The High Cost of Muscular Energy as Compared with Mechanical Energy

Muscular exercise is a good thing for maintaining bodily health and vigor. But, regardless of how strong you are you will no doubt be amazed to find that the money value of your strength is practically zero. For instance this writer once boasted about his feat of unloading 40 tons of coal from a railroad car in one day. He shoveled the coal to a height of 8 feet. He therefore did 40 x 2000 x 8 or 640,000 foot-pounds of work during that 10 hour day. He didn't get $5 a day as workers do now, but at that rate he would have done 1280 foot-pounds of work for one cent.

★ ★ ★

Now compare that with the cost of power as produced by fuel. The author has before him a statement by a prominent manufacturer of hoists who claims that his hoists will lift 100 pounds to a height of 1000 ft., for one cent. In other words that is 100 x 1000 or 100,000 foot-pounds for one cent as compared with the writer's puny 1280 foot-pounds for one cent. Divide 100,000 by 1280 and it will be found that the cost of human energy is 78 times that of energy produced by fuel. All of which means that, in terms of mechanical power, the true worth of unloading the above car of coal would be 6.4 cents and not $5.

★ ★ ★

What is your best feat of

(*Please turn to page* 1036)

Vertical Four-Slide Described in Bulletin

The new UB-3 Verti-slide vertical four-slide machine is described in a six-page technical bulletin just published by the Machine Division of **The Torrington Manufacturing Company,** Torrington, Conn. Adapted from a **Meyer, Roth & Pastor** vertical machine design, the UB-3 features advantages in high production, accuracy and rapid set-up previously difficult to obtain in this type of wire-forming equipment. The feed assembly, tooling, drive and other UB-3 components are shown in photos and detailed in the text. A specifications table gives all the data necessary for metalworking executives and tool engineers in evaluating the UB-3 characteristics in terms of their particular requirements.

★ ★ ★

Copies of Technical Bulletin UB-3 may be obtained by writing Machine Division, The Torrington Manufacturing Company, Torrington, Conn.

New Device To Strip Wire Coatings

A new stainless steel casting is helping to strip the tough hide of electric wires, making it safer and cheaper than methods used previously.

★ ★ ★

The new method was developed for a power company, using a stainless steel casting made by the Buffalo Plant of **Allegheny Ludlum Steel Corporation.**

★ ★ ★

The device is simplicity itself in operation. To operate, it is hooked over the wire or conductor, tightened by hand or with a hot stick (a 6-to-10 foot pole used by power companies for numerous jobs) until a stop is reached, then rotated around the conductor until the "chip" falls away. No nicks are possible since the cutter blade is correctly positioned by a built-in stop.

★ ★ ★

Linemen can now safely work on 12 KV conductors where formerly the electricity had to be cut.

★ ★ ★

There are 134 different type blades—all interchangeable. Each blade is especially designed for one size conductor and one thickness of covering, cutting any insulation from 3/64" to 12/64" thick. However, since most power companies have only about a dozen different size conductors, they need only that many separate types of blades.

Bulletin on Molykote

Bulletin 120, a new 2-color bulletin on Molykote Wear-In Compound, has been published by The Alpha-Molykote Corporation.

★ ★ ★

The bulletin discusses the effectiveness of the new compound in

LEGEND LARGE AND CLEAR ON INSULATED WIRE SURFACES —— USE GILLIES MARKING

GILLIES CONCAVE AND FLAT MARKING WHEELS PRINT YOUR

WHEELS AND MACHINES FOR BEST WIRE IDENTIFICATION

MARKING WHEELS and MACHINES for ELECTRIC WIRE

Gillies Engraved Concave and flat marking wheels are widely used printing the I.P.C.E.A. color code, numerical, semi-spiral striped, dating, or manufacturer's identification, etc. on insulated wire, tubing or hose.

Machines print on ONE or BOTH SIDES in large legible letters. Wheels are adaptable to any machine—or we will supply the machines.

Wheels, shafts, ink pans and all accessories are readily removable for quick and easy cleaning.

Wheels are made of TOOL STEEL, HARDENED to Rockwell test 61-64 and HARD CHROME PLATED.

Send for samples of wire and prices on wheels and equipment.

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eliminating the damage due to improper breaking-in of new or rebuilt machinery. Besides its basic use as a wear-in lubricant, Molykote Wear-In Compound is also an excellent lubricant for other troublesome friction applications in the average machine shop.

★ ★ ★

Ordering information, including prices, is included in the bulletin as well as photographs of the simple, 2-step method of applying the compound to insure positive protection against galling, seizing, scuffing, scoring, tearing, scratching and excessive abrasion.

★ ★ ★

Copies of Bulletin 120 are available by writing to the company at 65 Harvard Ave., Stamford, Conn.

The Role of Dislocations in Plastic Deformation of Metals

John C. Fisher presented the 7th Gillett Memorial Lecture at the 62nd Annual Meeting of the American Society for Testing Materials at Chalfonte-Haddon Hall, Atlantic City, N. J., on June 24.

★ ★ ★

This lecture, jointly sponsored by ASTM and Battelle Memorial Institute, commemorates **Horace W. Gillett,** first director of Battelle and one of this country's leading metallurgists.

★ ★ ★

It is now known that metals and other crystalline materials deform plastically through the motion of dislocations. These imperfections, which are wrinkles in the atomic layers of a crystal, have been observed by a number of experimental techniques, and their motion has been followed during the course of plastic deformation. High strengths can be achieved by eliminating dislocations entirely, or by the more common method of blocking their motion. At present the dislocation concept makes it possible to account semi-quantitatively for the strength of alloys.

★ ★ ★

Dr. Fisher is Physicist, Metallurgy & Ceramics, Research Department, **General Electric Company,** Schenectady.

124" DIAMETER
STEEL REEL
FOR ALUMINUM TUBING

For Greater Protection – Long Lasting Service

NYECO
Steel Shipping Reels

NYECO steel reels provide greater protection against damage in shipping and processing. Rugged, weather-resistant, splinter-proof, warp-proof . . . protects costly cable against damage due to dropping, bouncing, rough handling. Cost little more than wooden reels . . . last many times longer . . . require minimum maintenance.

PROMPT ATTENTION TO ALL INQUIRIES

Send specifications for STEEL SHIPPING REELS, IMPREGNATING REELS, PROCESSING REELS, SUBMARINE CABLE REELS AND BRIDGE REELS. Prompt deliveries on large or small orders.

NYECO ALSO MANUFACTURES
to your specifications

- Impregnating Tanks
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- Floor Rolls
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ANY QUANTITY — ANY SIZE — ANY FLANGE DIAMETER from 36" up

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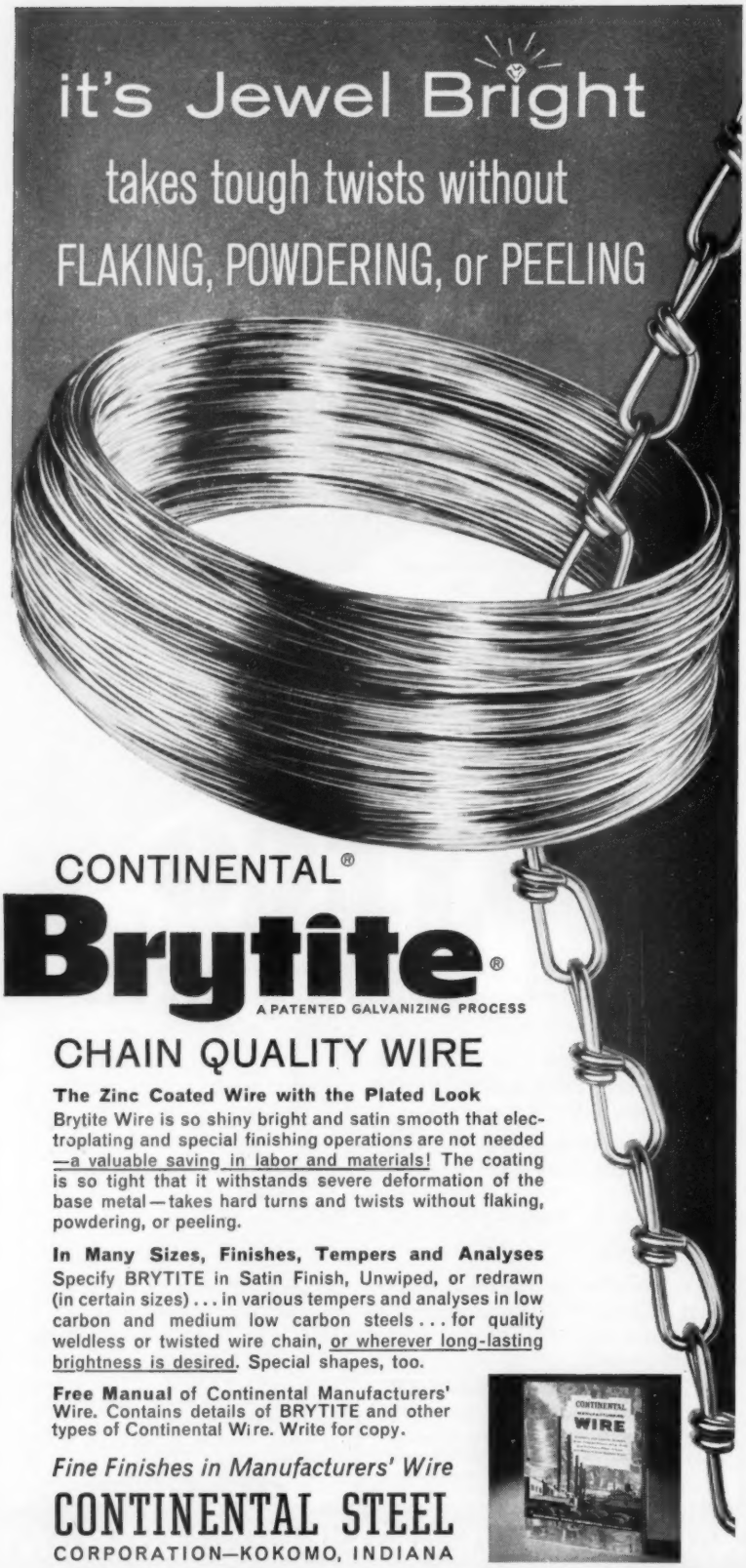

it's Jewel Bright
takes tough twists without
FLAKING, POWDERING, or PEELING
CONTINENTAL®
Brytite®
A PATENTED GALVANIZING PROCESS
CHAIN QUALITY WIRE
The Zinc Coated Wire with the Plated Look
Brytite Wire is so shiny bright and satin smooth that electroplating and special finishing operations are not needed —a valuable saving in labor and materials! The coating is so tight that it withstands severe deformation of the base metal—takes hard turns and twists without flaking, powdering, or peeling.
In Many Sizes, Finishes, Tempers and Analyses
Specify BRYTITE in Satin Finish, Unwiped, or redrawn (in certain sizes) . . . in various tempers and analyses in low carbon and medium low carbon steels . . . for quality weldless or twisted wire chain, or wherever long-lasting brightness is desired. Special shapes, too.
Free Manual of Continental Manufacturers' Wire. Contains details of BRYTITE and other types of Continental Wire. Write for copy.
CONTINENTAL WIRE
Fine Finishes in Manufacturers' Wire
CONTINENTAL STEEL
CORPORATION—KOKOMO, INDIANA
PRODUCERS OF: Manufacturers' Wire in many sizes, tempers and finishes, including Galvanized, KOKOTE, Flame Sealed, Coppered, Tinned, BRYTITE, Annealed, Liquor-Finished, Bright, and Special Shaped Wire. Also Reinforcing and Galvanized Fabric, Nails, Continental Chain Link Fence, and other products.

Wire Carrier Prices Reduced

The Northern Indiana Steel Supply Co., Fabricating Div., Michigan City, Indiana, has announced that prices on its line of Wire Carriers and Pay-Off Reels have been reduced. This was made possible by the wide acceptance of these products by the wire industry.

★ ★ ★

The substantial increase in the demand for the Carriers has made necessary larger production schedules, which have effected economies that they are passing along to their customers, according to **O. F. Seidenbecker,** Vice President. The units are made in various sizes that will handle coils of wire up to 4000 pounds in weight. Full information on the Wire Carriers and Pay-Off Reels will be supplied by the manufacturer upon request.

Publishes German-English Trade Dictionary

Verlag Stahleisen M. B. H., Breite Strasse 27, Dusseldorf, Germany, has published a comprehensive trade dictionary that should be of particular interest and value to those whose knowledge of Technical German is insufficient for the understanding of many terms and expressions.

★ ★ ★

The book lists over 7000 technical terms relating to the steel industry. Many business terms also are included. An appendix contains conversion tables on lengths, surfaces, volumes, weights, heats, pressures, energy, power, temperatures, measures, viscosity, et cetera.

★ ★ ★

The dictionary was first conceived in 1936 during a joint meeting of the Iron and Steel Institute of London and the Verein Deutscher Eisenhuttenleute. The present one has been enlarged and improved over earlier editions.

★ ★ ★

Published in pocketbook form, bound in artificial leather, 272 pages, the book sells for $3.00 per copy and may be ordered direct from the publisher.

Cable Manufacturer Building New Plant

Joseph J. Dowling, President of **Philadelphia Insulated Wire Co.,** Philadelphia, has announced the purchase of 10 acres of land and the start of the construction of a new plant on New Albany Road, Moorestown, N. J.

★ ★ ★

When completed, all operations will be transferred to the new address. The plant is a one-story structure with 50,000 square feet of floor space. The company has approximately 150 employees engaged in the manufacture of many types of insulated wire and cable, including wire for guided missiles and other airborne components.

★ ★ ★

Established by **Abednego Moore** in 1820, the company was the first to manufacture wire in the United States. Its first products were used for milady's billowing skirts and bonnets. As telegraphy, electricity and telephones were developed, the company kept step with progress by manufacturing wire for these uses.

★ ★ ★

The first recorded message sent by wire — "What hath God wrought?"—by **Samuel Morse,** on May 24, 1844, was carried from Washington to Baltimore on cable manufactured by the company. It also was the first American company to produce weather-proof cable.

★ ★ ★

Alfred F. Moore, grandson of the founder, endowed the Moore School of Electrical Engineering at the University of Pennsylvania. Another grandson, **Joseph Moore, Jr.,** endowed the Moore Institute of Art, Science and Industry in Philadelphia.

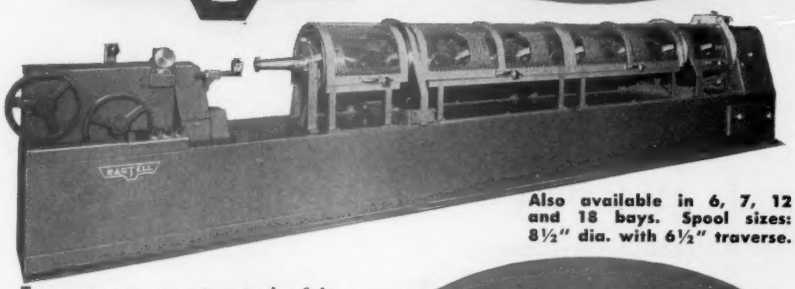
New Magnet Wire Standards

The following standards have been approved by both NEMA and ASA:

MW 6—1957 Single and Heavy Nylon-coated Round Copper Magnet Wire (80¢/copy)

MW 31—1956 Single paper-covered Round Copper Magnet Wire (50¢/copy)

BARTELL FOR THE BEST



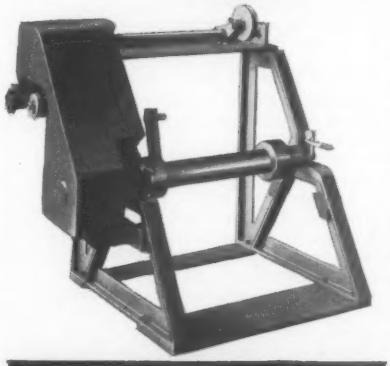
Also available in 6, 7, 12 and 18 bays. Spool sizes: 8½" dia. with 6½" traverse.

BARTELL SEVEN BAY HIGH SPEED STRANDER MODEL 7B-58-15

Frames are constructed of hot rolled shapes and plates to form a rigid box structure. Barrel is extruded 6062T-6 aluminum — Smooth starts through slip clutch driven by 7½ H.P. motor — Operators control station at front of machine — Main power control center at drive end — Electronically controlled automatic stop energizes solenoid operated brakes in event of wire breakage — Spool cradles and associated parts are completely interchangeable from one machine to another — Tungsten carbide wire guides throughout — Lay from ¼ in. to 5 in. long.

• CATERPILLAR CAPSTANS • SINGLE AND MULTIPLE HEAD RE-SPOOLERS • TAKE-UP & PAY-OFF STANDS FOR PLATING EQUIPMENT • WIRE STRANDERS

BARTELL TAKE-UP

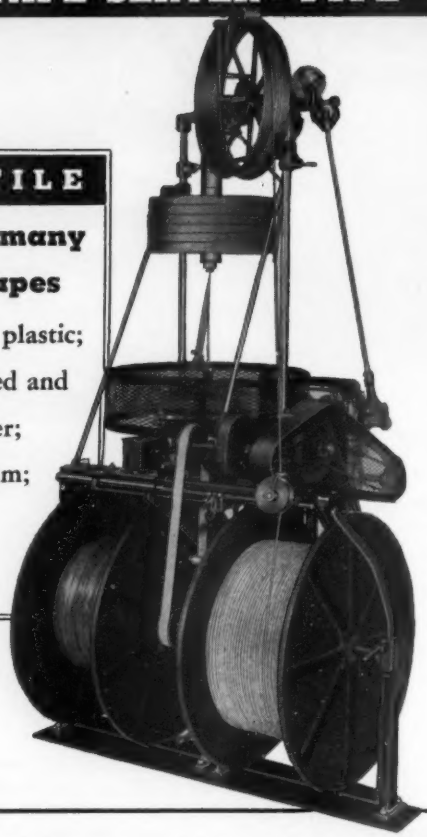


This Take-Up is belt-driven, the drive originating from a slip clutch located outside the capstan box. Electrically operated traverse adjustable from zero to maximum reel width. Accommodates reels up to 30" dia. Speed selector sheave adjusts lay on reel to suit diameter of finished strand.

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS

BARTELL MACHINE-TOOL CORP.
YACHT CLUB ROAD ROME, N. Y.
• DESIGNERS • MANUFACTURERS • ENGINEERS • CONSULTANTS

NEW WARDWELLIAN TAPE SERVER - TYPE "B"



VERSATILE

for serving many kinds of tapes

Teflon; vinyl; plastic; cambric; treated and untreated paper; glass; aluminum; brass and copper.

- Equipped with adjustable traverse, supply and windup stands, windup driving mechanism, and electric stop-motion. Capstan-release mechanism permits retracting conductor and replacing it for restarting operation after replenishing supply.
- Machine will apply tapes from ½" wide up to 1" wide on electrical conductors.
- "Reeves" variable speed unit provides for quick adjustment when change of lay is required.
- Production dependent upon width of material and angle of lay.
- Serving head speed dependent upon kind of material. Maximum speed 700 RPM.
- Driving pulley 8" diameter; 1¾" belt. Speed of pulley 330 RPM.
- Ratio serving head speed to pulley speed 2.12 to 1.
- Capstan 18" diameter, 3" face.
- Opening through serving head ⅝" diameter.
- Maximum diameter of flexible conductor ⅜".
- Supply packages 16" diameter, 1" maximum width, ½" minimum width. Size of hole in package 3".
- Supply tube holds eight reserve packages of 1" wide material.
- Maximum power requirement ¾ H.P.
- V-belt motor drive furnished upon request at additional cost.
- Reset counter for measuring product in feet furnished.
- Stands furnished to accommodate reels 30" or 36" in diameter with overall widths up to 16". Wider stands can be furnished upon request at additional cost.
- Special windup drive required for reels with drums under 12" diameter.
- Clamp lock holds windup reel arbor securely in lifter bearing.
- Machine mounted on base plate to assure proper alignment of frame and windup stand.
- Reels not furnished with machine.

Write for complete information

576

WARDWELL BRAIDING MACHINE CO.

1212 HIGH STREET
CENTRAL FALLS
RHODE ISLAND, U. S. A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

MW 33—1957 Paper-covered Rectangular and Square Copper Magnet Wire (one paper Three-quarter lap or four intercolated papers) (50¢/copy)

MW 42—1957 Glass fiber-covered Rectangular and Square Copper Magnet Wire (80¢/copy)

★ ★ ★

Copies of the foregoing standards may be ordered from the **National Electrical Manufacturers Association,** 155 East 44th St., New York 17, N. Y.

Machine to Measure Thickness or Diameter

A relatively inexpensive unit to detect thickness or diameters of any product that can be run through it has been developed by **Wire Insulating Machinery, Inc.,** 56 Hudson St., Northboro, Mass.

★ ★ ★

Originally developed to accommodate wire or cable up to one inch in diameter, flat materials also can be gauged by running the edge between the rollers.

★ ★ ★

Material is measured by passing it between a set of rollers, the bottom roller being stationary, the upper roller movable. Movement of the upper roller detects variations in product size to within plus or minus .005 of an inch. Electronically controlled, a signal light indicates when maximum or minimum tolerances have been reached. Easily adjustable micrometers located on the detector head for desired minimum or maximum settings.

★ ★ ★

Complete with its own electronic control, this unit will perform control functions such as stopping associated equipment, or indicating faults. For information, write the manufacturer.

Technical Folders on Special Purpose Alloy Wire

Harold Malm of **Little Falls Alloys, Inc.,** 189 Caldwell Ave., Paterson, N. J., has recently announced the publication of a series of folders designed to acquaint the engineer with the physical, chemical and electrical properties of special purpose wire manufactured by

Little Falls Alloys, Inc.

★ ★ ★

Each separate folder deals with a specific product manufactured by the company. Folders are presently available on Nickel Clad Titanium, Bronze & Brass wire and Silvercote Beryllium Copper wire.

★ ★ ★

The folders describe the way in which present customers of the company utilize specially manufactured wire and describes why the properties of that particular wire are an advantage.

★ ★ ★

This series of folders may be had by writing directly to the attention of L. W. Halleran, Sales Manager, Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N. J.

Prentiss Quality Control System

A network of quality control stations has been established at **Prentiss Wire Mills,** Riverside-Alloy Metal Division, H. K. Porter Company, Inc. This emphasis on quality control, an extension of a program started 101 years ago, includes a step by step progression of tests by skilled personnel.

★ ★ ★

Prentiss quality control begins before the raw material is shipped by suppliers. Prentiss orders rod according to tight specifications. The laboratory of the steel mill checks all heats as they are produced.

★ ★ ★

When rod bundles arrive, the ends are examined under microscopes and those with laps and other faults are eliminated. Sections of wire are imbedded in bakelite, ground, polished, etched and photographed for study and control purposes. As the work progresses from one department to another, physical tests are made before starting each new operation. In addition, spot checks are performed at irregular intervals throughout the mill by skilled personnel.

★ ★ ★

The abundance of modern testing equipment at Prentiss, such as

For Fungus Resistance, Specify

TEXTILENE TWI-TAR

Offering great durability along with light weight, Textilene Twi-Tar is successfully used for buried communication cable (bedding and overall serving), expanded ACSR cable (expander between core and conductors), stationary power cable and portable cables.

Twitchell's superior Textilene line also includes: Moisture-resistant fillers — *Twi-Flex* and *Twi-Wax*. Used for non-metallic sheathed cable, maritime shipboard cable, varnished cambric cable.

Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all types of portable and flexible cords.

*Patent Applied For

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation — also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E.W. TWITCHELL INC.

Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

Wire Men Who Want **REEL** Economy

Think of **APCO MOSSBERG** first

It's simple arithmetic! There's little difference between first cost and *final* cost when you specify Apco Mossberg reels, spools and bobbins. Why? Because Apco's engineered all-steel construction lasts longer . . . is strong, safe, easy to handle!

Think, too . . . with each Apco Mossberg custom-designed unit, you get the *exact* balance and trueness you specify. Production-wise, Apco all-steel construction assures smooth spool-out without wire breakage or trapping . . . keeps downtime to the minimum . . . keeps your production rate up to date.

In every way, Apco Mossberg gives you *reel* economy that makes real sense. Wire, write or phone collect for preliminary recommendations. No obligation, of course.

PACIFIC COAST REPRESENTATIVE:
Gordon Proffitt
World Trade Center
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47 Colburne Street, West
Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS

micrometers, tensile testers, etc., contrasts sharply with the items displayed in the Prentiss Museum. This museum, a show case exhibiting old-time tools, dies and gauges, amounts to an actual history of wire drawing.

Submerged Arc and Inert Gas Welding Wires

A comprehensive and information-packed 6-page folder on Page Submerged Arc and Inert Gas Welding Wires, and designated as Bulletin DH-402-C, has been revised and expanded. by the **Page Steel and Wire Division, American Chain & Cable Company, Inc.,** Monessen, Pa.

★ ★ ★

Featured is a concise description of the uses of 26 different analyses of stainless steel, low alloy, and mild carbon steel automatic welding wires. This guide, welcome to the user with a special problem, also informs the regular user of what he can expect from a specific analysis.

★ ★ ★

The folder also describes the many Page methods of packaging these welding wires in fibre drums, corrugated cartons, paper-wrapped coils, and standard spools.

Large Coils Save Money

Copperply* copper-plated steel wire is now available in 1000 lb. reelless coils that reduce shipping weight by 12½% according to **Richard W. Elder,** vice president for specialty sales, **National-Standard Company.** The reelless Copperply coils are strapped two to a one-way pallet.

★ ★ ★

"Return reel freight and record keeping expense on returnable reels is completely eliminated," Mr. Elder said. "The new packaging gives greater protection while saving weight," he added, "because each coil is wrapped tightly all around by machine with an overlapping vapor barrier."

* Copperply is the registered trademark of the National-Standard Company.

Molykote Selector Chart

Bulletin 121, a Molykote Lubricant Selector Chart which facilitates the choice of the proper lubricant for practically any extreme pressure lubrication job, has been published by **The Alpha-Molykote Corp.**

★ ★ ★

The Selector Chart evaluates every type in the Molykote Lubricant line based on temperature, environment, method of application, incorporation into common materials, and recommendations for various parts, operations and conditions.

★ ★ ★

A brief technical description of each type is also included.

★ ★ ★

Copies may be obtained from The Alpha-Molykote Corporation, Stamford, Conn.

Current Temperature Characteristics of Aluminum Conductors

Completion of the first portion of a new, long-range program to prepare a basic series of technical reference manuals for the electrical industry has been announced by **Aluminum Company of America.**

★ ★ ★

The initial project is a new publication, "Current-Temperature Characteristics of Aluminum Conductors." It comprises section six of "Alcoa Aluminum Overhead Conductor Engineering Data," title of the entire program.

★ ★ ★

This first section is a 20-page presentation of the latest available information on the current-temperature characteristics of both ACSR (Aluminum Conductor, Steel Reinforced) and stranded aluminum conductor. The booklet contains graphs showing current-temperature characteristics for the most-used sizes of these conductors. Formulas are provided to facilitate calculation of characteristics for other sizes.

★ ★ ★

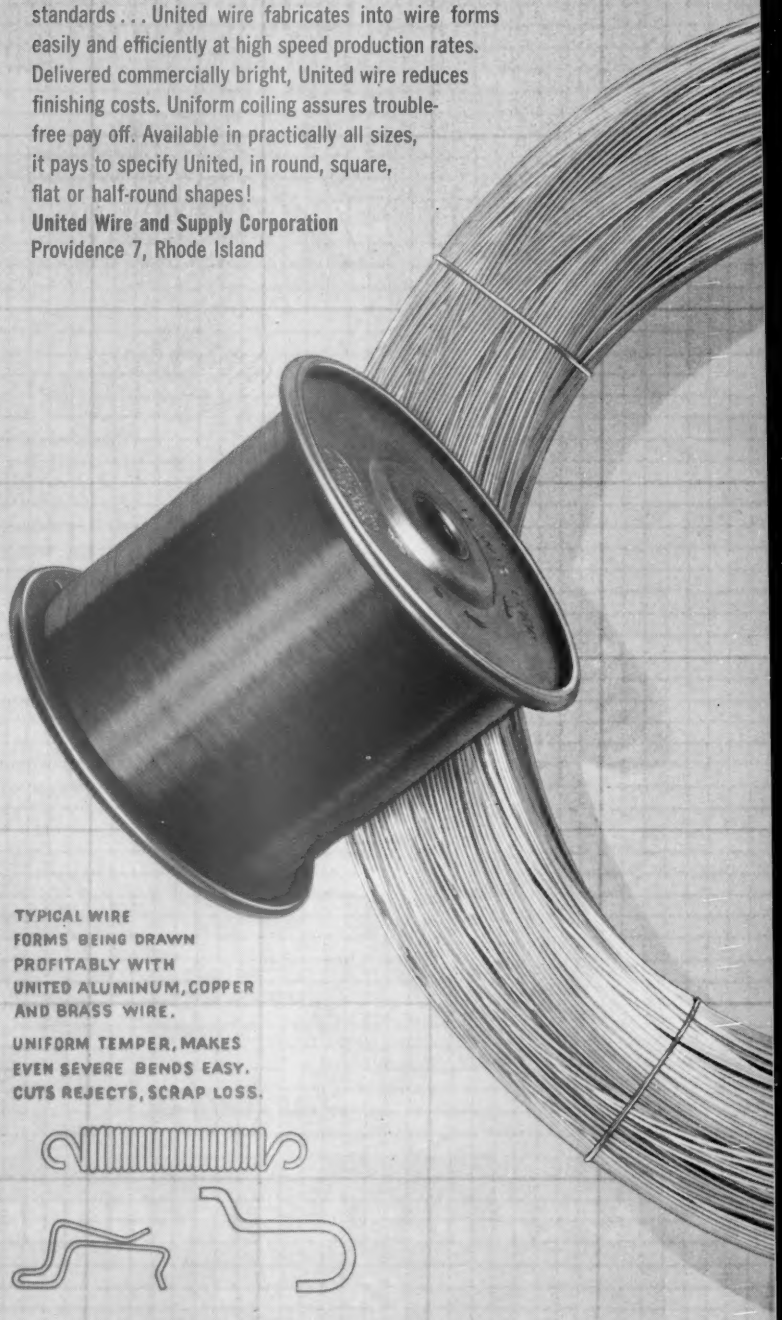
Represented in the report are results of research recently com-

TOLERANCE

Reason why — it Pays to Specify
United Aluminum, Brass and Copper **Wire**

Drawn or shaped to your most exacting tolerance and temper standards . . . United wire fabricates into wire forms easily and efficiently at high speed production rates. Delivered commercially bright, United wire reduces finishing costs. Uniform coiling assures trouble-free pay off. Available in practically all sizes, it pays to specify United, in round, square, flat or half-round shapes!

United Wire and Supply Corporation
Providence 7, Rhode Island

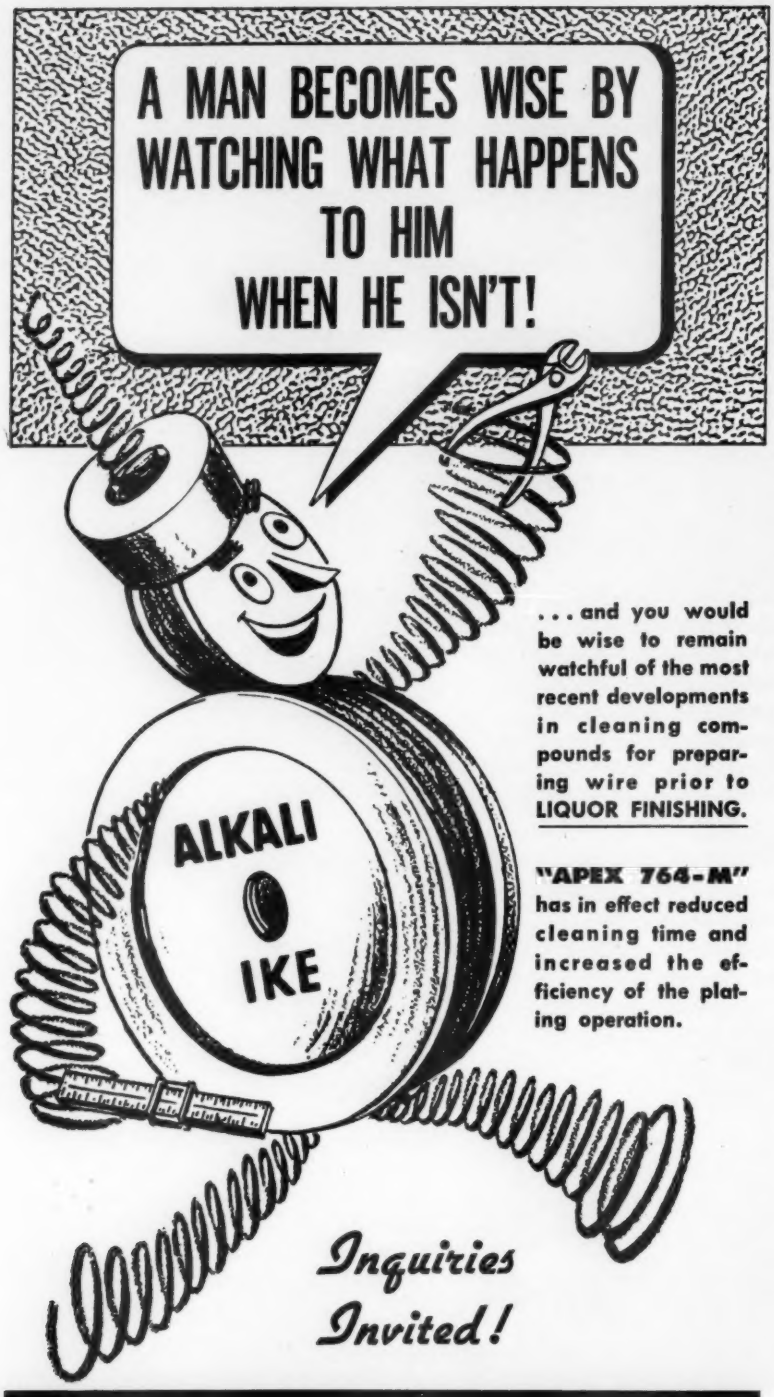


TYPICAL WIRE FORMS BEING DRAWN PROFITABLY WITH UNITED ALUMINUM, COPPER AND BRASS WIRE.

UNIFORM TEMPER, MAKES EVEN SEVERE BENDS EASY. CUTS REJECTS, SCRAP LOSS.

For aluminum, brass and copper wire and tube
For silver brazing alloys . . . always **Specify**

UNITED



. . . and you would be wise to remain watchful of the most recent developments in cleaning compounds for preparing wire prior to LIQUOR FINISHING.

"APEX 764-M" has in effect reduced cleaning time and increased the efficiency of the plating operation.

Inquiries Invited!

APEX ALKALI PRODUCTS
Company
Lubricants & Cleaning Compounds
for Wire and All Wire Products
Main and Rector Streets Philadelphia 27, Pa.
IV 3-3939

pleted by Illinois Tech, Purdue, and the electrical conductor division of Alcoa Research Laboratories.

★ ★ ★

Subsequent sections of the Alcoa reference series will be released as they are prepared.

★ ★ ★

The first section is available on request from any Alcoa sales office, or from 774 Alcoa Building, Pittsburgh 19, Pa.

National Electric Ships Its Biggest Cable

National Electric Division of H. J. Porter Co., Inc. has shipped the first part of a 2000 foot order to Hawaii for 15,000 volt underground service. It is the largest cable the company has produced.

★ ★ ★

The first reel, 7 feet in diameter and 5 feet wide, contained an 850 foot length of 3½ inch lead sheathed cable weighing 15 pounds per foot.

★ ★ ★

The cable consisted of three-conductor cable about ⅞ inch in diameter, insulated with varnished cambric tape and covered with a lead sheath. The total order will consume 5½ tons of copper and 9 tons of lead.

Translations Available

The British Iron and Steel Translation Service, of The Iron & Steel Institute, 4 Grosvenor Gardens, London, S. W. 1, England, has made the following translations of foreign language articles, copies of which may be purchased from the Institute:

#652—The Present Position of Cold-Heading, Cold-Pressing and Flow-Pressing in Bolt Manufacture. (Ł 4.0.0)

#908—Drawing and Push-Pointing of Cold-Rolled Steel Bars (Ł 5.0.0)

#590—Phosphate and Water Gloss Coatings in Wire Prior to Drawing (Ł 1.15.0)

#857—The Technological Requirements for Automation of Wire and Wire Products Production (£ 2.0.0)

#751—The Continuous Wire Rolling Train at the Wendel Plant at Joeuf (£ 1.10.0)

#752—The Continuous Wire Mill of the Société Métallurgique de Normandie (£ 1.10.0)

#672—Layout of High Capacity Rolling Mills for Light Steel Sections and Wire Rod (£ 6.0.0)

#749—The New Light Section and Wire Rod Mill of the Klockner - Hutten - Werk Haspe in Hagen - Haspe (£ 6.10.0)

#793—The Modern 4-Strand High Speed Continuous Wire Rod Mill at Hikari Works (£ 1.15.0)

#762—Hot Rolling with Idler Roll Stands in a Continuous Wire Mill (£ 3.0.0)

#561—Leading Wire Rolling Mill Practice (£ 5.0.0)

#544—Mechanical Descaling, Particularly Bend Descaling, in Wire Production (£ 6.5.0)

#1131—The Adhesive Strength of Zinc Coatings on Heavily Coated, Hard Drawn Wires of Rimmed Low Carbon Steel (£ 3.10.0)

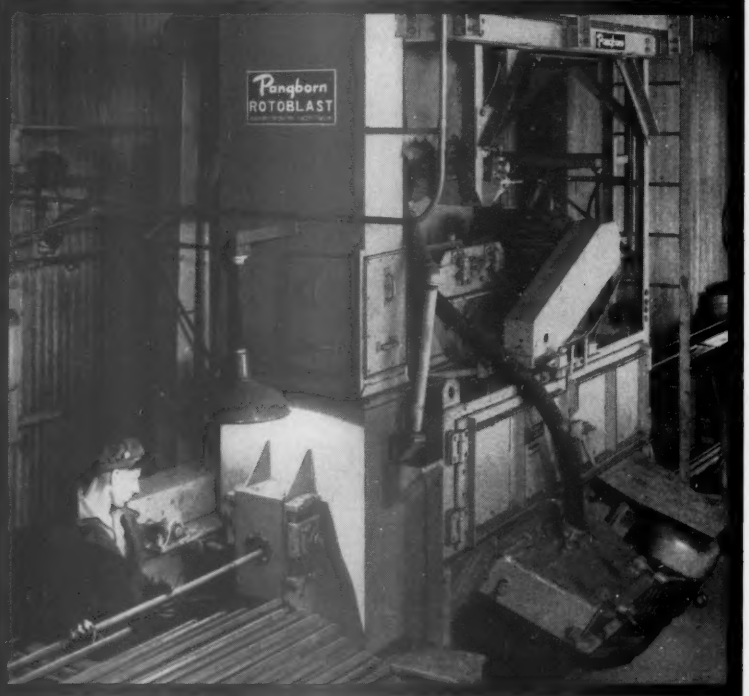
Kennicott to Expand

Charles R. Cox, president of **Kennicott Copper Corp.** reported at the annual meeting of stockholders that the acquisition of **The Okonite Company** was a "first step" in a major expansion in the electric transmission field. **Chase Brass & Copper Company** also is scheduled for expansion.

* * *

Last year when Okonite was acquired, the **Kennicott Wire and Cable Co.** in Rhode Island was integrated into this larger subsidiary. The expansion plans are being undertaken to enable Kennicott Copper to secure a larger share of the wire market than it now can serve through its present manufacturing facilities.

ROTOBLAST CUTS DESCALING COSTS TO 80¢ A TON!



Steel producer descales 6 tons of rod an hour at minimum cost with Pangborn Rotoblast

To facilitate the cleaning of hot rolled rod, a large steel producer has recently replaced former cleaning methods with a Pangborn Rotoblast Descaling Machine.

The quality of cleaning has been excellent and even though the machine is still not in full operation, preliminary runs already indicate increased production capability with greatly reduced costs. In a recent run, 42,000 lbs. of rod were processed in 3½ hrs. blast time—6 tons per hour—and estimated Rotoblasting costs in the range from 1″ to 2″ average about 80¢ per ton. This is *overall* cost . . . including maintenance, power, abrasive and labor.

Of course, the amount of savings vary at different Rotoblast installations. But if *you* must cut costs—whether you have a standard or special descaling problem—your solution is Pangborn Rotoblast. Ask the Pangborn man in your area or write PANGBORN CORPORATION, 5400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment —Rotoblast Steel Shot and Grit.*®

Pangborn

Cleans it fast with ROTOBLAST®

Outstanding Personalities of the Wire Industry

To Head Research at Firth-Sterling

A veteran Pittsburgh research and development engineer and inventor, regarded as one of the nation's leading authorities on powder metallurgy, has joined the top management team of **Firth-Sterling, Inc., Kenneth Mann**, president, has announced.

★ ★ ★

John C. Redmond, former vice president in charge of metallurgical research and development for **Kennametal, Inc.**, assuming the post of director of research at Firth-Sterling on June 1, succeeding **David F. Dickey**, who has resigned.

★ ★ ★

Mr. Redmond spent 15 years in research work for Kennametal, becoming vice president in 1951. Earlier he spent 10 years in chemical and metallurgical posts with Youngstown Sheet and Tube Company—and in similar posts for shorter periods with Battelle Memorial Institute, Thomas A. Edison, Inc., and the National Bureau of Standards. He holds a B.S. degree from Hamilton College and an M.A. from George Washington University and completed additional graduate work at the University of Maryland.

Durant Appoints Two New Representatives

Durant Manufacturing Co., Milwaukee, manufacturer of instrument and industrial counters, has announced the appointment of new representatives.

★ ★ ★

DeShazo & Associates, Inc. of Birmingham, Alabama, will represent Durant in the state of Alabama. **Lee DeShazo** is manager of the firm.

★ ★ ★

In the San Francisco area **Transmission Engineering Co.** has been appointed. Manager is **Robert E. Galbraith.**

★ ★ ★

Durant feels that these changes in territory assignments will align the company with aggressive sales organizations that are technically oriented to handle the full Durant line of counting instruments.

Promotions Announced By Michigan Oven

Staff promotions for formation of a new management team have been announced by **Michigan Oven Company**, Detroit, Mich.

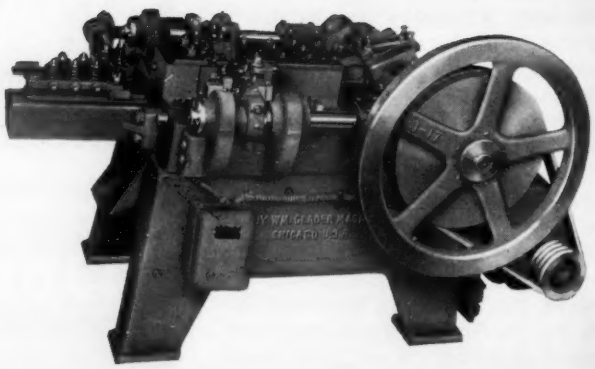
★ ★ ★

New chairman of the board is **A. C. Towne**, formerly Michigan Oven Company president; moving up to president from sales manager is **L. M. Gill.** Vice president **C. A. Windsor** was formerly in

GLADER NAIL MACHINE

a NAME and MACHINE
that have stood for
DEPENDABILITY since 1887

$ $ $ $ $ $ $ $ $ $ $ $ $
our Nail Machine
"KNOW-HOW"
means $$$ for you



Wm. GLADER MACHINE WORKS
210 N. RACINE AVENUE
CHICAGO 7, ILLINOIS

EXPORT DEPT. 122 EAST 42ND STREET • NEW YORK 17, N. Y.

charge of Wire and Wire Products department, and secretary-treasurer **B. C. Smith** was promoted from secretary and chief design engineer.

★ ★ ★

Towne has been a Michigan Oven Company director for the past 10 years and company president since 1951. Gill was sales manager for 7 years. Windsor has been a company director since 1957, and Smith served as company secretary since 1955.

Ben Davis Retires

Benjamin H. Davis, prominent figure in the development of rubber and plastic extruders and wire insulating machinery is retiring from active management participation in **Davis-Standard Corp.** and **The Standard Machinery Company** of Mystic, Connecticut. He will continue however as a consultant to the two firms.

★ ★ ★

Mr. Davis, well known in his field and the holder of many patents, joined The Standard Machinery Company in 1948 to develop their plastic and rubber extruding equipment and the wire machinery lines. When Davis-Standard was formed to handle the sales of Standard Machinery's products, he was made its operating head and has continued in this capacity.

★ ★ ★

Both companies merged in 1956

Benjamin H. Davis

with Franklin Research Corp. of Boston and now function as divisions of the Boston firm. Davis became a vice president and director of Franklin at that time.

★ ★ ★

In 1955 Davis-Standard negotiated the largest extruding machine order ever issued in the world, a $1,110,000 contract with the U. S. Army Signal Corp.

★ ★ ★

"Ben Davis' wealth of experience in rubber and plastics extrusion techniques has been a major factor in the development of wire insulating machinery and in the growth of our companies during the past ten years. His consulting work will be invaluable to us and is available for customers' application studies and problems," said **John R. Wheeler,** vice president of Standard Machinery in making the announcement.

Roebling Promotes Ridge

The appointment of **William C. Ridge** as executive vice president of **John A. Roebling's Sons Corporation,** subsidiary of **The Colorado**

FASTER PRODUCTION LOWER COSTS A SNAP!

UL APPROVED

Electrix SEPARABLE PLUGS

You build better cord sets . . . faster and at lowest cost per finished unit with ELECTRIX Separable Plugs. Even more important, you get high quality, because ELECTRIX Separable Plugs have great holding power, a finer finished appearance, and pass the most rigid in-use tests.

Assembly is easy with the time-proven Electrix Automatic Attaching Machine.

Write for complete information.

Electrix Corporation ASHTON ● RHODE ISLAND

Fuel and Iron Corporation, has been announced by **A. F. Franz,** president of C. F. & I.

* * *

Formerly vice president, production, Mr. Ridge succeeds **Charles R. Tyson** who recently resigned his post. Mr. Ridge joined Roebling in 1942 as an engineer and has served progressively as manager of the standards engineering division, manufacturing manager of the electrical wire division and as works manager. He is a graduate of Massachusetts Institute of Technology.

Joins Riverside-Alloy

George A. Schneider has been appointed to the sales force of **Riverside-Alloy Metal Division, H. K. Porter Company, Inc.,** according to **F. H. Conant,** General Sales Manager. He will cover portions of the Mid-West from the Division's Chicago district office.

* * *

Prior to joining the Porter division, Mr. Schneider was associated with **Wickwire-Spencer Steel Div., Colorado Fuel & Iron Corp.,** and has had five years experience as a steel salesman in Indiana and Illinois. He will now represent Riverside-Alloy's three plants, Riverside, Alloy and Prentiss. A graduate of the University of Illinois, he specialized in industrial marketing and mechanical engineering.

Southern Electrical Announces Appointments

Changes in the organization of **Southern Electrical Company,** Chattanooga, Tenn., an operation of the Metals Division of **Olin Mathieson Chemical Corp.,** were announced by **Milton L. Herzog,** vice president and general manager of operations, Metals Division.

* * *

H. D. Seaton Sr., formerly general manager, has been appointed consultant to **N. H. Collisson,** vice president and general manager, Metals Division. In his new capacity, he will assist and advise Metals Division management on Southern Electrical manufacturing and sales activities.

* * *

Mr. Herzog also announced the appointment of **Charlton W. Smith** as plant manager with responsibility for the operation of the Chattanooga plant where Southern Electrical products are manufactured. He will report to **Harry E. Gude,** vice president for manufacturing, Metals Division.

* * *

H. H. Bullen was named director of electrical conductor sales, reporting to **Derek Richardson,** vice president of aluminum sales, Metals Division.

Y. S. & T. Appoints Engineer

The Youngstown Sheet and Tube Company announces the appointment of **Phillip L. Arnold** as service engineer attached to the company's Detroit district sales office, 926 Fisher Bldg.

KEEP COOL!

DON'T GET BURNED THIS HOT SUMMER WITH SPOOL PROBLEMS...

Boonton's "PLASTISPOOLS" are dropping temperatures everywhere with stock plastic spools that are

- **RUGGED**
- **ONE PIECE**
- **LIGHT WEIGHT**
- **CRUSH AND WARP RESISTANT**

A PHONE CALL OR LETTER WILL BRING SAMPLES AND PRICES FROM

BOONTON MOLDING CO.

BOONTON, NEW JERSEY TELEPHONE DEerfield 4-4400

Mr. Arnold joined Youngstown in 1957 in the metallurgical department and was graduated in May from a student engineering and supervisory training course. He is a graduate of the University of Cincinnati.

Joins Acrometal as Research and Development Specialist

Fred J. Bieber, president of **Acrometal Products, Inc.,** Minneapolis, Minn., has announced that **Edward H. Harris** of Cassopolis, Michigan, has joined the research and development staff of Acrometal to increase the scope of this company's growth in the wire equipment field. He will do special research and development work on special machines and products for the wire industry.

★ ★ ★

Acrometal's engineering department, under the supervision of chief engineer **Clarence Steinbeck** and the imaginative thinking of Mr. Bieber (also an engineer), has expanded rapidly into the field of designing special equipment to meet special problems of the wire industry. The company has made numerous contributions in recent years to the packaging and processing of fine wire. The addition of Ed Harris (well-known for his experience in the fabrication of wire) indicates an acceleration of this Acrometal service. He has served in the wire industry for

Edward H. Harris

twenty-nine years as a plant manager, product engineer, project chief and production man, and is thoroughly familiar with the intricate problems of making, packaging and handling wire.

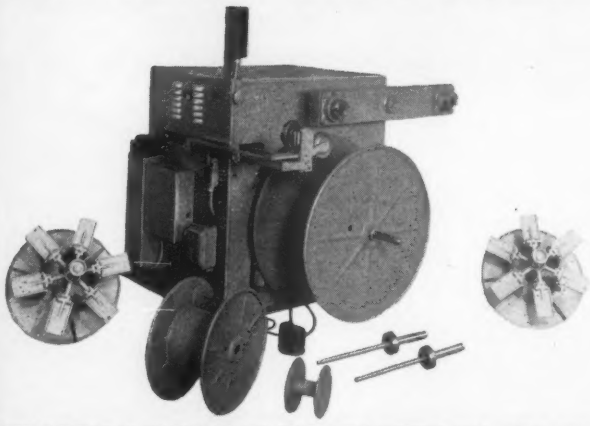
★ ★ ★

His most recent affiliation was with **Hudson Wire Co.** as divisional manager and research engineer at their Cassopolis, Michigan, plant. Prior to that he was with **General Cable Corp., Wheeler Insulated Wire Co.** and the **Starring Co.** He has also planned and developed special operating projects for **Bridgeport Insulated Wire, Arthur Slepian Co., Universal Wire & Cable, Ltd.** of Montreal, and others. He also will be used as a consultant for customer service—thus making his practical experience available to Acrometal customers on special in-plant problems.

R B & W Elects Sales V.P.

John S. Davey has been elected vice president in charge of sales for **Russell, Burdsall & Ward Bolt and**

FOR FASTER—MORE UNIFORM WIRE PRODUCTION



DAVIS ELECTRIC CO. RE-SPOOLER AND COILER WITH INDEXING HEAD, MODEL CRS-1

EXCLUSIVE DESIGN FEATURES

1. Indexing head on top has interchangeable shaft feature to accommodate 5/8" up to 1¼" shafts or to your specifications. 2 Davis Collapsible Coiling heads can also be used. Reel sizes on indexing head up to 27" diameter.
2. Maximum production can be accomplished with indexing head—when spooling wire on reel or collapsing head operator can be packaging the reel or coil just finished.
3. Lower shaft will take reels up to 30" diameter, also has interchangeable shaft feature for 1¼" or 1½" diameter shafts or to your specifications.
4. Infinitely adjustable speed, adjustable width traverse synchronized with spooling speed for reels up to 16" traverse.
5. Electronic speed control with 10 to 1 range for wire speeds up to 1200 feet per minute, or higher if specified.
6. Adjustable Time Acceleration starts machine with low torque factor to avoid stretching and/or breaking of wire.
7. Electric disc brake for quick stopping of both upper and lower shafts.
8. External Tachgenerator can be supplied if desired for constant wire speed.

DAVIS WIRE & CABLE EQUIPMENT

DAVIS ELECTRIC CO.

WALLINGFORD, CONNECTICUT

DUAL and SINGLE TAKE-UPS • PAY-OFFS • CAPSTANS
SPARK TESTERS • RE-SPOOLERS
RAM-TYPE TEFLON EXTRUDERS

Nut Company, it was announced here by **William E. Ward,** president.

* * *

Mr. Davey has served R B & W in executive engineering, marketing and production capacities for thirty years, most recently as vice president in charge of research and engineering. Previously he was assistant sales vice president and assistant to the general manager. A mechanical engineering graduate of Massachusetts Institute of Technology in 1924, Mr. Davey joined R B & W in 1929 after serving as an engineer with The Babcock & Wilcox Company.

* * *

Widely recognized as an authority on fasteners, Mr. Davey is active in many engineering associations. He is presently chairman of the research committee of the Industrial Fasteners Institute, and twice served as chairman of the Institute's committee on standards and technical practices. He is an active member of the American Standards Association committee on standardization and unification of screw threads, the Iron and Steel Technical Committee of the Society of Automotive Engineers, several committees of the American Society of Testing Materials, and the Research Council on Riveted and Bolted Structural Joints.

GE Appoints Atlantic District Manager

Harry H. Jason has been appointed Manager — Atlantic District of the **General Electric Company's Metallurgical Products Department.** In his new position Mr. Jason will be responsible for all sales and service activities of the District's Carboloy cemented carbide and related products.

* * *

Mr. Jason is being transferred from Atlanta, Georgia, where he has been serving as manager of the Department's Southern District. Prior to that he has also served as manager of the New England District and the Midwestern District. He joined the General Electric Company in 1946.

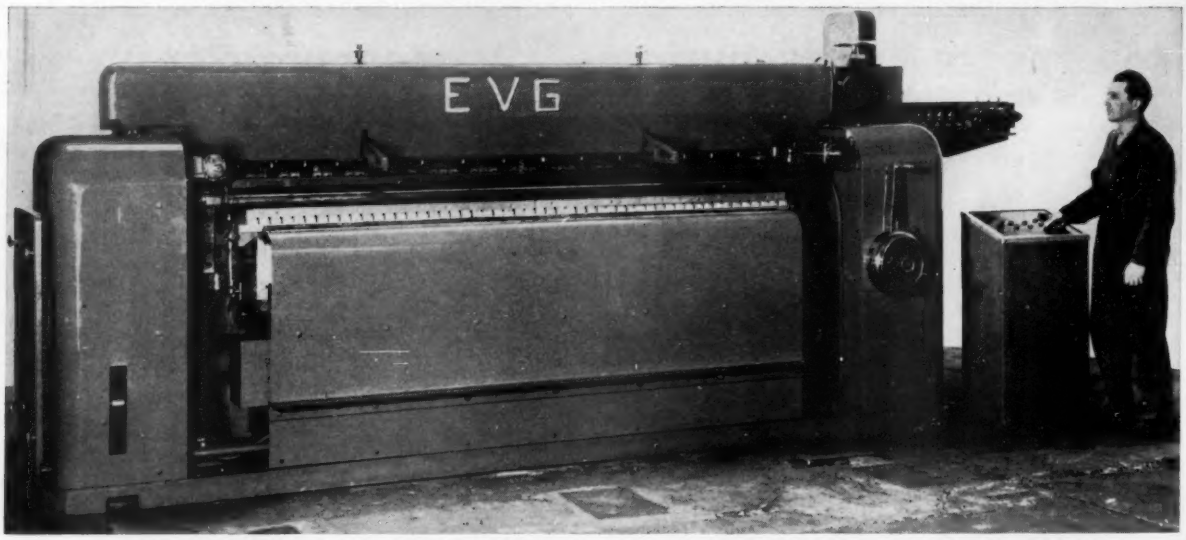
* * *

The appointment was effective July 1, 1959. He will be located at the Atlantic District headquarters, 760 Colfax, Kenilworth, N. J. The Atlantic District covers all of New England, Delaware, Maryland and the eastern portions of New York, Pennsylvania, and Virginia.

Warren Dreher Heads WRI

Warren D. Dreher, Wire Products Sales Manager, Western Division, **Colorado Fuel & Iron Corporation,** has been elected president of the **Wire Reinforcement Institute. Bruce D. Bennett,** Manager, Construction Material Sales, **American Steel & Wire Division,** United States Steel, has been named vice-president. The two men were elected to office at the recent annual meeting of the U. S. (and Canadian) trade association of welded wire fabric manufacturers at White Sulphur Springs, W. Va.

* * *



TAILORED WIRE FABRIC WELDING PLANTS

Now Available in U.S.A.

Bringing tremendous advantages over other welders, EVG's line of wire fabric welding plants offers increased versatility and profit to American mesh manufacturers. (Shown in photograph above is EVG's Standard Duty model G5 with a working range of 4/0 to 10 gauge.) All EVG wire fabric welding plants feature the latest type automatic feeding, straightening and cutting devices, full electronic controls and adjustments for pressure, heat and dwell. Fabric changeover is economic and speedy. Available in five base models—fine-wire, light, standard, medium and heavy-duty. No waste capacity—great savings in capital investment and floor space reduction.

Available for inspection in actual production in U.S.A. and Canada. Direct inquiries to Richard E. Kleinhans, 122 East 42nd Street, New York, New York, OXford 7-0770.

A Colorado State University graduate of 1942, Mr. Dreher first joined CF&I in 1945. His initial assignment was as a sales engineer for wire products in the Denver office. In 1950 he was named Assistant to the Wire Products Sales Manager, and attained his present position in 1954.

★ ★ ★

Mr. Bennett, the new WRI vice president, was born in Wilkes-Barre, Pa., and attended Pennsylvania State College. He spent several years in various apprenticeship training courses with American Steel & Wire, after joining the Division in 1935.

★ ★ ★

He was a wire rope salesman in the Chicago sales office from 1938 to 1943, when he was named to head the Wilkes-Barre, Pa., sales section as manager of sales. In 1947, he was promoted to manager, wire rope and construction material products, in the Chicago office. In 1957, he was promoted to manager, construction materials sales, for the entire division, with offices in Cleveland.

Elected Vice-President of Nichols Wire

La Verne W. Disney has been elected Vice-President and Treasurer of the **Nichols Wire & Aluminum Co.,** Davenport, Iowa. He was also re-elected a Director of the Company, a position he has held since 1952.

La Verne W. Disney

★ ★ ★

Mr. Disney joined the Nichols Company in 1951 as Assistant Treasurer and Controller and was promoted to Treasurer and Controller in 1952. Prior to his association with Nichols he was an executive with the Owens-Illinois Glass Company.

★ ★ ★

Nichols Wire also promoted three veteran executives. **Girard J. Brenneman** was named Marketing Manager, **James D. Case,** Manager of Sales, Mill Division, and **C. L. Johnston,** General Manager, Warehouse Division.

★ ★ ★

All three began as Sales Representatives of the Nichols Company, Brenneman joined Nichols 12 years ago and later became Assistant Sales Manager. Case came to Nichols 9 years ago and advanced to Products Manager and Division Sales Manager. Johnston, with 13 years service, has been Assistant Sales Manager and Manager of Sales for the Warehouse Division.

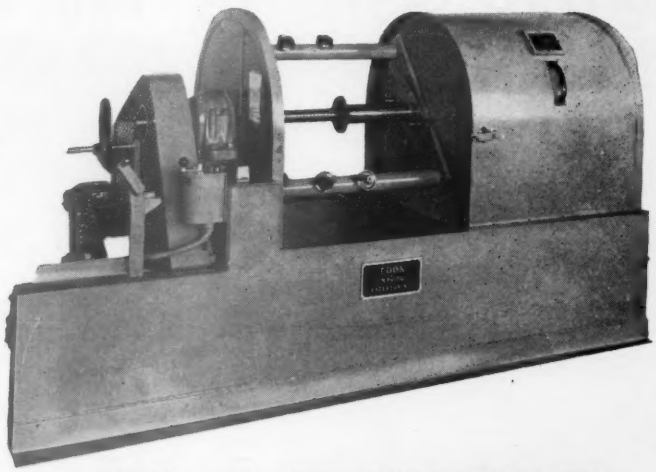
Your answer for producing bunched wire with the smooth concentric qualities of stranded wire . . .

COOK

BUNCHER-STRANDER

makes every foot of wire perfectly uniform

For concentric wires with layers made up of wires in opposite lay directions, or for semi-concentric wire with layers in same direction but with different lays . . . a Cook Buncher-Strander delivers uniform wire at high speed. The secret is the single twist flyer and the Cook patented method of providing differential speeds between flyer and reel. Why delay? Get the complete details today by writing for illustrated brochure.



MODELS AVAILABLE	BH-8	BH-12	BH-16	BH-21	BH-22	BH-24
CAPACITY	40 lbs.	100 lbs.	250 lbs.	350 lbs.	500 lbs.	1000 lbs.

A MODEL FOR EVERY PRODUCTION NEED

COOK

MANUFACTURING CO.

50 EAST 25th STREET, PATERSON, N. J. • ARMORY 4-6380

CANADIAN AGENT:
E. V. LARSON CO., LTD., TORONTO, CANADA

EUROPEAN AGENTS:
CAPAMADJIAN LE MONNIER CIE LTD., PARIS, FRANCE
KNOERZER & CO., STUTTGART, GERMANY

Amchem Promotes Russell to Chief Engineer

George Russell has been promoted from Assistant to Chief Engineer by **Amchem Products, Inc.,** manufacturers of chemicals for agriculture and the metalworking industry.

★ ★ ★

Mr. Russell, who has been with Amchem since 1947, is a member of the National Society of Professional Engineers and a past president of the Valley Forge Chapter of the American Institute of Plant Engineers. He succeeds Mr. Jay Biery, who recently retired after 31 years with Amchem.

SKF Names District Manager

Appointment of **Holton E. Fox** to the post of district manager, Philadelphia District Sales Office, has been announced by **Stuart H. Smith,** vice president—sales, **SKF Industries, Inc.**

★ ★ ★

Formerly a field engineer in the ball and roller bearing manufacturer's Pittsburgh District, he fills a vacancy created by the appointment of **Harold W. Speidel** to the newly created position of manager, Sales Product Planning. He joined SKF in 1951 and is a graduate of the Stevens Institute of Technology.

Personnel Changes at Universal-Cyclops

William D. Dickey has been elected Treasurer of **Universal-Cyclops Steel Corp.,** Bridgeville, Pa. He was formerly executive vice president of Magnetics, Inc., and previously was associated with the H. K. Porter Company as general auditor and assistant treasurer. He becomes the chief financial officer of the company and will direct the activities of the general accounting and cost control organizations.

★ ★ ★

He replaces **William L. Forgie** who has resigned the office of treasurer, but will continue as Vice President—Planning, which post he has held since 1955.

Furnace Engineer Joins Reynolds

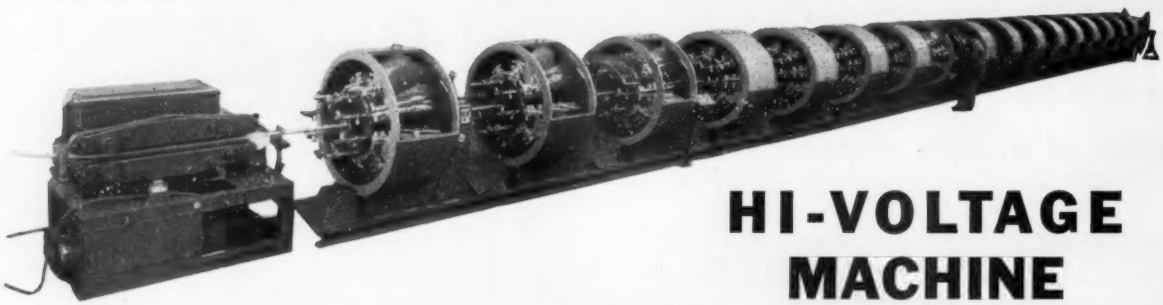
Appointment of **Charles R. Wilt, Jr.,** as processing furnace engineer for **Reynolds Metals Company** was announced today by **D. J. Hedgecock,** chief engineer.

★ ★ ★

Mr. Wilt joined Reynolds Metals after nearly eight years with **Loftus Engineering Corp.,** Pittsburgh, where he was assistant chief engineer. Prior to that he was a power and fuel engineer with United States Steel at Braddock, Pa. He was graduated from Pennsylvania State University in 1950 with a degree in mechanical engineering.

Vereeke Heads Heil Corp.

Edwin W. Vereeke, formerly Executive Vice President, has been elected President of Heil Process Equipment Corp., Cleveland, Ohio manufacturers of corrosion resist-



HI-VOLTAGE MACHINE

300 K.V.

- 296 Papers.
- 6 20 Paper Heads, 16" Pad.
- 11 16 Paper Heads, 20" Pad.
- Q.B. Type Caterpillar Haul-off, Maillefer Patent.
- Lay Adjusted by P.I.V. Driving Each Head and P.I.V. on Caterpillar.
- Total Length of Equipment for 296 Papers, Including Caterpillar, but Exclusive of Let-off and Take-up: 118".

POURTIER Machines

76 a 82, Rue de la Fraternite

ROMAINVILLE (Seine) FRANCE

ant ventilating equipment, tanks and tank linings, etc., succeeding Carl E. Heil, founder and former President, who was elected Chairman of the Board of Directors.

★ ★ ★

Mr. Vereeke graduated from Ohio Wesleyan University in 1943. After doing graduate work at Western Reserve University, and serving in the Navy, he joined Heil as an Estimator in 1946. He became Sales Engineer in 1948; Sales Manager in 1950; Vice Pres.—Sales in 1952; Executive Vice Pres. in 1954; and has now become President of the Company.

Edwin W. Vereeke

Blane Names Sales Representatives

J. M. Waldecker and **Paul E. Heffelfinger** have been appointed new District Sales Representatives for the Philadelphia office of the **Blane Corporation,** according to **Gerry Kerstein,** Vice President and Sales Manager.

★ ★ ★

Mr. Waldecker has been active in the industrial field for over 24 years, and will service Blane accounts in New York, Pennsylvania, New Jersey, and the Eastern seaboard, including the Carolinas. Associated with him will be Mr. Heffelfinger, well-known manufacturer's representative and graduate engineer.

Carpenter Steel Promotes Research Men

Two men in the metallurgical department have been promoted by **The Carpenter Steel Co.,** Reading, Pa., to assistant managers of research.

Norman D. Groves has been named assistant manager of research in charge of chemistry and physics. **Neil J. Culp** has been made assistant manager of research in charge of metallurgy.

★ ★ ★

Before joining Carpenter, Groves was corrosion engineer at the Hanford Atomic Products Operation of the General Electric Co. He was employed by Carpenter as a corrosion engineer in 1956. Culp joined Carpenter on his graduation from Lehigh University in 1952 in the metallurgical department. He first became head, and later, supervisory metallurgist of the firm's alloy development group.

AS&W Names Superintendents

Edwin E. Caspell has been appointed general superintendent of

Another Development ...by Hubbard!

PLYWOOD MARRIES STEEL

FOR BETTER SHOP REELS

RESULTING IN

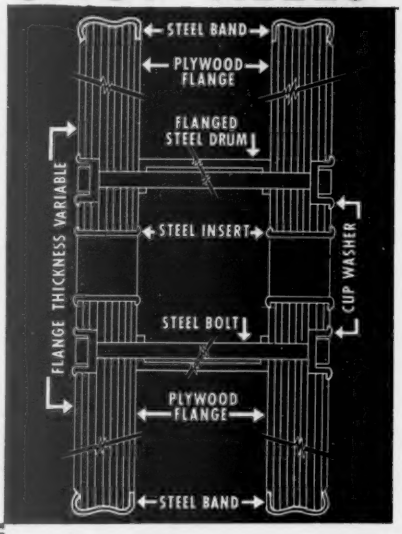
1 GREATER IMPACT STRENGTH

2 LOWER MAINTENANCE COSTS

3 LIGHTER WEIGHT FOR EASIER HANDLING

4 CAN BE SUBMERGED IN WATER

5 WIDE RANGE OF SIZES



LOWER INITIAL COST

FOR DETAILS CONTACT

HUBBARD SPOOL DIVISION

The American Pulley Company

GARRETT, INDIANA

Donora Works of **U. S. Steel's American Steel & Wire Division,** it was announced by **L. F. McGlincy,** Pittsburgh district manager of operations for the Division.

★ ★ ★

Mr. Caspell succeeds **U. F. Corsini,** who died suddenly on May 10. A native of Cleveland, O., Mr. Caspell began his career with the Wire Division there at Newburgh Works in 1927, while attending the University of Cincinnati on a cooperative work schedule. Upon graduation from the University in 1932, with a B. S. degree in mechanical engineering, he was assigned as a technical apprentice at New Haven (Conn.) Works.

★ ★ ★

John J. Grimes, Jr. was appointed general superintendent for New Haven (Conn.) and Trenton (N.J.) Works of U. S. Steel's American Steel & Wire Division, according to **S. B. Metcalfe,** Worcester district manager of operations for the Division. He succeeds E. E. Caspell, who recently moved to the Division's Donora (Pa.) Works as general superintendent.

★ ★ ★

Mr. Grimes is a native of Birmingham, Ala., where he took his early schooling. He is a graduate of the Colorado School of Mines with an E. M. degree in mining and metallurgy.

★ ★ ★

Both men have worked in a number of the company's mills and have advanced steadily over the years.

New ASTM National Officers 1959-1960

Announcement has been made of the new national officers for the **American Society for Testing Materials,** who were officially seated at the 62nd Annual Meeting, Atlantic City, N. J., June 21-26, 1959.

★ ★ ★

F. L. LaQue, Vice-President and Manager, Development and Research Division, The International Nickel Co., has been elected President. **Miles N. Clair,** President, The Thompson & Lichtner Co., was elected Vice-President. **A. Allan Bates,** Vice-President of Research and Development, Portland Cement Association, continues as Senior Vice-President.

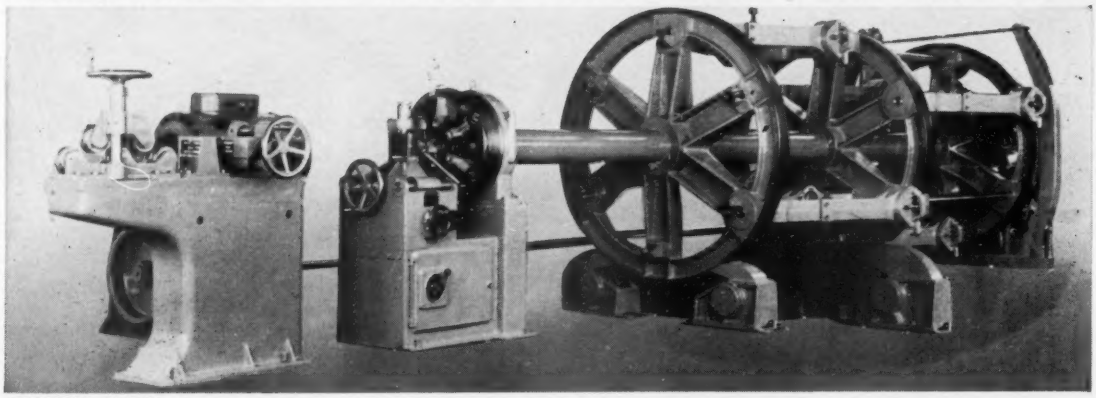
★ ★ ★

Elected for three-year terms on the Board of Directors were the following: **A. B. Cornthwaite,** Engineer of Materials and Tests, Department of Highways, Commonwealth of Virginia; **C. L. Kent,** Assistant Director of Technical Services, The Jones & Laughlin Steel Corporation; **H. C. Miller,** Laboratory Engineer in Charge of the Testing Laboratory, Public Service Electric and Gas Co. (N. J.); **C. E. Nixon,** Head, Electrochemistry & Polymers Dept., Research Laboratories, General Motors Corporation; **H. D. Wilde,** Research Coordinator, Humble Oil & Refining Co.; and **I. V. Williams,** Materials Engineer, Bell Telephone Laboratories.

★ ★ ★

Elected for a two-year term, in accordance with a change in the

WE OFFER SUPERIOR MACHINES MEETING ALL REQUIREMENTS FOR THE MANUFACTURE OF ELECTRICAL WIRE & CABLE, WIRE ROPE ETC.



SHOWN HERE:
6 SPPOL LAYING-UP MACHINE with variable geared back turn for wire ropes from 15 mm (19/32") to 40 mm (1-9/16") diam.
Spools: 90 mm (35½") flange diam. Weight of full spool: 1000 kg (2200 lbs.)

J. A. KRAFT MASCHINENFABRIK, OLPE/WESTF., GERMANY
HANCOR, INC., 468 Fourth Ave., New York 16, N. Y.
SOLE REPRESENTATIVE IN THE U.S.A. AND CANADA

Society's by-laws, is **Robert D. Thompson,** Chief Development Engineer for Commercial and Glass Products, Taylor Instrument Companies.

New District Sales Manager Appointed for Chicago Area

John C. Cassidy has been appointed to the position of Chicago district sales manager for the **Page Steel & Wire Div., American Chain & Cable Company, Inc.,** according to an announcement made by **Joseph N. Kemple,** general manager. This district covers the states of Illinois, Missouri, Kansas, Indiana, Wisconsin and Minnesota.

★ ★ ★

Prior to his promotion, he had been district sales manager of Page's Houston, Texas territory since July 1, 1954. Mr. Cassidy joined American Chain & Cable Company in 1949 after graduation from Western Reserve University with a degree in Business Administration.

Crucible Steel Appointments

Dr. F. C. Langenberg has been appointed manager of Process Research by the **Crucible Steel Company of America.** Formerly chief development metallurgist at the Company's Midland, Pa. works, he will now be responsible for developing technical specifications for all process research facilities at the Crucible Technology Center.

★ ★ ★

At the same time it was announced that **C. E. Newcomb** has been named Manager of Research Facilities Planning. He will coordinate the design and construction and provide planning and analysis for proposed new technical facilities.

★ ★ ★

Daniel A. Porco has been appointed to the newly created position of Assistant to the President by the **Crucible Steel Company of America.** He was formerly Manager of the Corporate Development Section.

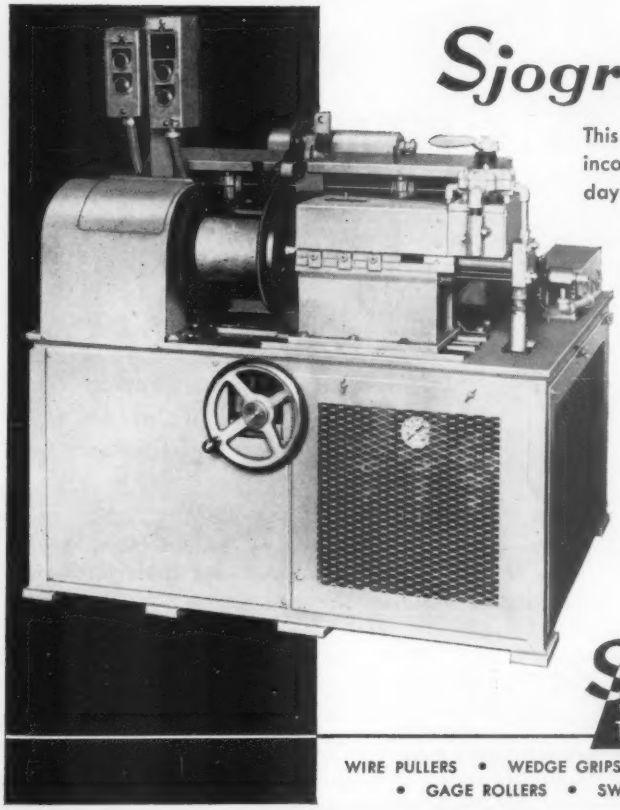
Robert B. Hewett, Chief Industrial Engineer, has been named to fill the post vacated by Mr. Porco, and **George I. Ziders,** Works Industrial Engineer at the Company's Sanderson-Halcomb plant in Syracuse, will replace Mr. Hewett.

Atlantic Steel Appoints Manager of Mill Sales

The appointment of **Gordon E. Brooks** as manager, mill sales of **Atlantic Steel Company** has been announced by **R. E. O'Neill,** general manager of sales for the Atlanta firm.

★ ★ ★

Mr. Brooks has been connected with Atlantic Steel since 1933, and has served in the Company's order and scheduling departments, as well as in various sales capacities. In 1948 he was made sales representative for north and central Georgia, and in 1953 became Atlanta territory sales representative. In January, 1957 he was named assistant general manager of sales.



Sjogren SPOOLER

This machine is especially designed for wire mill use and incorporates many outstanding features adapted to present day high speed production.

SPEED — When placed directly behind wire drawing machine the Sjogren Spooler is capable of spooling at 1800 fpm.

CAPACITY — 100 pound maximum.

TRAVERSE — Hydraulic traverse is infinitely adjustable from zero to 5/8" per rpm of spool.

LOADING — Loading of spool is air-actuated.

TENSION — Louis-Allis eddy current clutch type motor with potentiometer for variable tension.

STARTING — Forced acceleration circuit prevents slack wire during wire drawing machine acceleration.

BRAKING — Goodyear airplane disc type brakes.

USED BY WIRE MEN WHO WANT THE BEST!

Sjogren TOOL & MACHINE CO., INC.

14 Sword St.
AUBURN, MASS.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • GAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

Spring Manufacturers Association Summer Meeting

Approximately 100 members of National Spring Manufacturers Association assembled for a two-day convention at Worcester, Mass. on June 15. **Harry C. Faust,** President of **Paragon Spring Company,** Chicago, President of the Association, was in charge of the meeting, with **George E. Underwood,** of Bristol, Conn., as Executive Secretary.

★ ★ ★

It was the first convention the association has held in Worcester, birthplace of the American Wire Industry, where much of the wire used in the manufacture of springs is still produced.

★ ★ ★

After a brief opening meeting in the Hotel Bancroft, the members separated into groups to tour three Worcester wire company plants whose officials were sponsors of the convention. These were **Worcester Wire Works, New England High Carbon Wire Co.** and **Johnson Steel & Wire Co.**

★ ★ ★

The second day of the convention the members visited the plant of **Sleeper & Hartley, Inc.** whose president, **William H. Welch,** held open house for them and made available the interesting points of his operations. The highlight of this tour was the initial showing of the new Sleeper & Hartley automatic spring coiler and looper, which was developed by **Elmer W. Halvorsen,** Chief Engineer. This machine can produce 3,000 springs per hour with loops and is the first produced in this country that can automatically form and loop the spring in one operation, thus eliminating the conventional looping machine, it was announced.

★ ★ ★

In the afternoon the Association members concluded their convention with their annual business meeting at the Wachusett Country Club, after which a luncheon was served and a golf tournament held competing for the Memorial Trophy.

★ ★ ★

Mr. Faust announced that the Annual Meeting of the Association is always held in New York City approximately the first week in December.

New Carbide Catalog

Metal Carbides Corporation, Youngstown, Ohio, manufacturers of Talide tools, dies, blades, wear parts and rolls, has just produced a new 68-page catalog.

★ ★ ★

The new Metal Carbides catalog No. 59-G, covers the complete Metal Carbides product line including brazed tools and tips, Klamp-Lok Toolholders, throw-away blanks, centerless blades, rolling mill rolls, heavy metal and technical data regarding the proper application of Talide metal to cutting, drawing and wear-resistant applications.

HEAVY DUTY
BREAK-DOWN REELS

1000#
2000#
4000#
} capacities

Rugged Design including patented DURA-CURL rim, and many other features necessary to provide the *Strength* and *Durability* needed for continued successful performance.

Also complete line of sizes of Modern High Speed Wire Drawing NO-CREV Spools and Reels for both fine and intermediate size wire.

Mossberg PRESSED STEEL Corporation
"Division of Wanskuck Co."
18 WEST ST., ATTLEBORO, MASS., U.S.A.

Telephone
Attleboro 1-0848

#101

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50c for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,888,716, BARRIER STRUCTURE patented June 2, 1959 by Charles B. Kaufmann, Moline, Ill.

The barrier is constructed of lengths of wire or rod and said to be adapted to prevent birds from alighting on buildings and animals from climbing up trees, poles and the like.

★ ★ ★

No. 2,888,740, COMPOSITE DUCTILE WIRE, patented June 2, 1959 by Louis J. Danis, Detroit, Mich., assignor to Eaton Manufacturing Company, Cleveland, Ohio, a corporation of Ohio.

A coilable composite wire is disclosed comprising a tube of nickel, nickel base alloy, cobalt or its alloy, iron or stainless steel, for example, filled with a mixture of metals or metalloids (chromium, tungsten, cobalt, carbon, etc.) which, together with the tube, will provide a desirable hard facing alloy when welding is applied.

★ ★ ★

No. 2,888,959, MACHINE FOR ASSEMBLING BED SPRINGS, patented June 2, 1959 by Thomas F. Winters, Issaquah, Wash.

More specifically, the machine is for clipping in position a number of volute coil wire bed springs by use of crimped lacing wires and clips formed and applied by the machine. There are 14 claims.

★ ★ ★

No. 2,888,960, BED SPRING MACHINE, patented June 2, 1959 by Charles H. Gail, Los Angeles, Calif., assignor to Spring Machinery Company, Los Angeles, Calif., a corporation of California.

The machine is said to be adapted to produce bed springs of the type disclosed in U. S. Patent No. 2,663,038, dated December 22, 1953. The invention deals more particularly with machine parts to control the operation of the forming and feeding mechanism for the helices to connect adjacent rows of spring wire coils and cutting and twisting mechanism for the ends of the helices.

★ ★ ★

No. 2,889,096, BICYCLE BASKETS, patented June 2, 1959 by Clarence S. Glenny, Rockford, Ill., assignor to The Washburn Company, Worcester, Mass., a corporation of Massachusetts.

A basket is disclosed with sides, ends and bottom of wire for attachment to the handle bars of a bicycle.

★ ★ ★

No. 2,889,562, SPRING UNIT FOR CRIBS AND THE LIKE, patented June 9, 1959 by William W. Gleason, Chicago, Ill., assignor to Nachman Corporation, Chicago, Ill., a corporation of Illinois.

Eyes in the terminal convolutions of the wire coil springs extend outwardly through slots in flat sheets of rigid sheet stock (as cardboard, fiberboard and the like) with straight wire lengths threaded through the eyes.

★ ★ ★

No. 2,889,921, CONTAINER FOR WIRE, patented June 9, 1959 by Eber J. Hubbard, Fort Wayne, Ind., assignor, by mesne assignments, to The American Pulley Company, Philadelphia, Pa., a corporation of Pennsylvania.

More specifically, the container is for wire coiled in the space between concentric inner and outer tubular walls with end caps and a spring-biased pressure plate between one end cap and the adjacent end of the coil.

★ ★ ★

No. 2,889,935, HAT HANGERS, patented June 9, 1959 by Hubert L. Thornburg, Newberg, Oreg.

A hanger for supporting a hat vertically is provided, the hanger being composed of a single length of wire bent to shape.

★ ★ ★

No. 2,889,936, BOOT HOLDER, pat-

world wide sales...
U.S.A.
NORWAY
SWEDEN
AUSTRALIA
SCOTLAND
FRANCE
NORTHERN IRELAND
RHODESIA
INDIA
ENGLAND
AUSTRIA
CANADA
SOUTH AFRICA
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WALES
EIRE
BELGIUM
ITALY
CZECHO SLOVAKIA
. . . indicate a world-wide reputation. Hanson & Edwards have supplied High Speed Tubular Stranding Machines to many of the most important Wire Rope and Cable factories throughout the world. These machines have rotors which run in large SPLIT ROLLER BEARINGS, not on support rollers, giving higher speeds, smoother running and lower maintenance costs
ROLLER BEARING TYPE
HIGH SPEED TUBULAR
STRANDING MACHINES
Made in various sizes for reels from 5"x 2½" up to 24"x 12" Write now for details
HANSON & EDWARDS LTD
WARRINGTON ENGLAND
SALES ORGANISATION
JAMES DAY (MACHINERY) LTD
28 MADDOX STREET LONDON W1
U.S. AGENTS:—THE EDMANDS COMPANY 860 WELLINGTON AVENUE CRANSTON 10, R.I.
P2035

ented June 9, 1959 by Donald E. Kassner, Waterloo, Iowa.

The holder is of spring wire and adapted to grasp the heel of an inverted boot or, obviously, a shoe.

★ ★ ★

No. 2,889,972, BOOTJACK AND SCRAPER COMBINED, patented June 9, 1959 by Merlin Johnson, Alexander, Iowa.

This device is comprised nearly wholly of wire or rod material, bent to shape.

★ ★ ★

No. 2,890,464, BED SPRING, patented June 16, 1959 by Louis Elliott Frey, Los Angeles, Calif.

The wire coils and cover are so arranged that space is left for accommodating the ends of the bed coverings so that the latter will not form lumps when the coverings are tucked in.

★ ★ ★

No. 2,890,819, DUAL CARRIER BASKETS FOR BICYCLES, patented June 16, 1959, by Clarence S. Glenny, Rockford, Ill., assignor to The Washburn Company, Worcester, Mass., a corporation of Massachusetts.

Baskets of wire lengths are provided so constructed and arranged that they may be suspended in balanced positions from a bicycle. Sixteen claims.

★ ★ ★

No. 2,891,584, WIRE CLOTH, patented June 23, 1959 by Richard E. Lovett, Dixon, Ill., assignor to National Standard Company, Dixon, Ill., a corporation of Delaware.

Woven wire cloth is patented consisting of woof wires, a multiplicity of spaced apart, warp wires, and one or more special warp elements interposed between the warp wires, the special warp elements each comprising a ribbon of wire braid.

★ ★ ★

No. 2,891,803, COLLAPSIBLE SHOPPING CART, patented June 23, 1959 by Julius Mintz, New York, N. Y.

The cart, aside from wheels and the like, is constructed of wire or rod lengths. Five claims.

★ ★ ★

No. 2,892,013, BULKHEAD SEAL FOR WIRE BUNDLES, patented June 23, 1959 by Edward N. Gomberg, Torrance, Calif., assignor to Douglas Aircraft Company, Inc., Santa Monica, Calif.

More specifically, this invention relates to electric insulators of the bushing type adapted to insulate wires extending through a wall.

★ ★ ★

No. 2,892,562, FOLDABLE CAGE CONSTRUCTION, patented June 30, 1959 by Wilmore K. Smithson, Los Angeles, Calif.

A collapsible, foldable wire cage for animals is disclosed comprising a number of interconnected wire, grille-like peripheral walls.

★ ★ ★

No. 2,892,598, CABLE DRUM GROOVING, patented June 30, 1959 by Kenneth W. Dudley, Redondo Beach, Calif., assignor, by mesne assignments, to The National Supply Company, Pittsburgh, Pa., a corporation of Ohio.

A specially formed riser groove in the drum of the device is provided. Eleven claims.

★ ★ ★

No. 2,892,880, MULTI-STRAND, ABRASION RESISTANT ELECTRICAL CONDUCTORS, patented June 30, 1959 by Robert Hohn, Neuss am Rhine, Germany.

For use in a water cooling sleeve, the inventor provides a highly flexible electrical cable, including multi-strand wires disposed closely adjacent each other in concentric layers, having therebetween thin, open and pervious layers of highly rot and abrasion resisting plastic material such as polyamide or polyurethane affording passages for cooling liquid to flow through the cable and preventing frictional contact and wear between adjacent conductive strands of wires.

Wire Screening for Insect Electrocution

The Deljen Corp., Electrocuting Fly Screen Div., Pleasant Valley, N. Y., is producing a variety of wire screens for killing flies and night-flying insects.

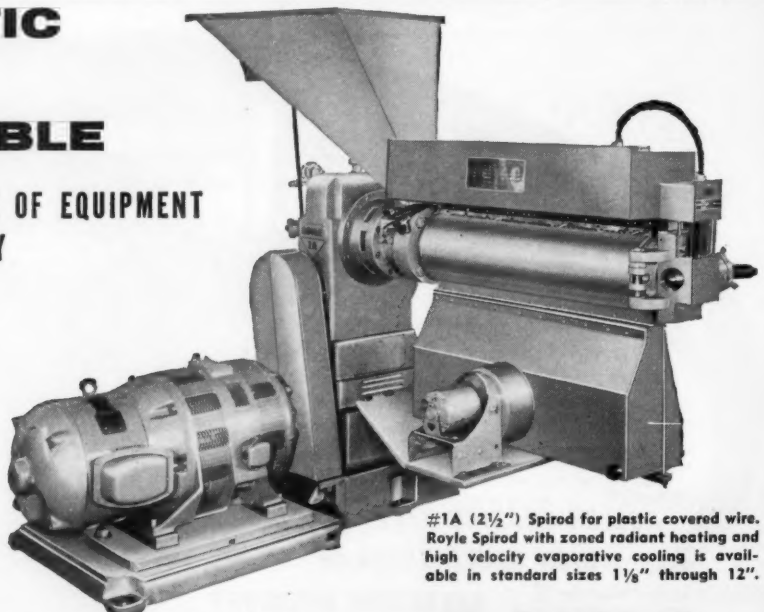
★ ★ ★

These screens may be inserted in doors or windows or come in lantern type forms for use outdoors. Such types are equipped

FOR PLASTIC COVERED WIRE AND CABLE

ROYLE'S COMPLETE LINE OF EQUIPMENT FOR THE WIRE INDUSTRY

- PAYOFFS
- BELT WRAP CAPSTANS
- COOLING TROUGHS
- AIR WIPER ASSEMBLIES
- DUAL-WHEEL CAPSTANS
- SINGLE REEL TAKEUPS
- DUAL-REEL HI-SPEED TAKEUPS



#1A (2½") Spirod for plastic covered wire. Royle Spirod with zoned radiant heating and high velocity evaporative cooling is available in standard sizes 1⅛" through 12".

NEW:-

ROYLE WIRE HEAD

Small Volume — Controlled Flow
Easy Fixture Removal — Easy Cleanout — Self-Centering Characteristics

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. — Hyde Park 2430 - 0456
Home Office — V. M. Hovey J. W. VanRiper — SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter Co. — BLackstone 3-9222
Downey, Cal. — H. M. Royal, Inc. — TOpaz 1-0371
Tokyo, Japan — Okura Trading Co., Ltd. — (56) 2130 - 2149

with black lights to attract insects.

★ ★ ★

All of the devices must be connected to some nearby electrical outlet. A transformer is employed to make the current safe for human contact. Very little current is actually consumed. They have been found useful both for homes or plants where insects are a problem.

Heat Sealable Mylar* Tapes

Peters Manufacturing Company, Wollaston, Mass., producers of electrical tapes, coated fabrics and films announce the development of Rubber Coated Mylar which will heat seal in the 200°F. temperature range. The Peters tape gauges 3 mils (using 1 mil base film) is coated on one side and may be furnished in any color. In addition to heat sealing, the key advantages are:

Thinness of gauge.
Highly waterproof.
Excellent color stability.
More compatible than resin coatings as there is no plasticizer migration.

* DuPont Trade Mark

The Underwriters' Laboratories have already approved its use over

Service Entrance Cable—courtesy of Crescent Insulated Wire & Cable Co., Inc. * * *

the single conductors in Service Entrance Cable (see photo) and it is being employed in other wire and cable applications according to **J. J. Lowe,** Vice President in Charge of Marketing for Peters. The tape is available in other gauges and constructions.

Chain Link Fences

Data and information on the Page Registered Fence, the fence with a pedigree, is contained in a well-illustrated 4-page folder, Bulletin DH-8, issued by the **Page Steel and Wire Division, American Chain & Cable Company, Inc.,** Monessen, Pa.

These fences are offered in distinctive styles to enclose, protect or beautify residential, industrial, institutional areas, etc. Fabrication details, styles, heights, and typical installation photographs have been included.

To Do Commercial Research for AS&W

The appointment of **Robert W. Bauer** as assistant manager, commercial research division, general sales department of the **American Steel & Wire Division** was announced by **William H. Guterl,** manager of marketing of this U. S. Steel Division.

★ ★ ★

In his new responsibility Mr. Bauer will be primarily concerned with the direction of market studies, and short and long range market forecasting.

Sole Representative: Paul Reicher Machinery & Equipment, P.O. Box 127, Willowdale, Ont., Canada

New Nail Coating Machine

The Manpro Vibra is the first production nail coating machine ever placed in operation. Nails automatically enter the coater from a Manpro Vibra nail cleaner and are coated and dried as they travel 54′ up a spiral elevator inside a 4x5 foot tank. Nails emerge clean, separated, and dry so that they will not stick when packed. This completely automatic in-line operation is designed for high output with virtually no manpower requirements.

★ ★ ★

First Manpro Vibra production nail coater is currently operating at the Cortland, New York plant of **Wickwire Brothers, Inc.** Their initial experience shows that nail coating can now be accomplished six times faster than ever before.

★ ★ ★

The machine can also be used for coating or painting of numerous parts in addition to nails. Other model Manpro Vibras are already widely used for high production in-line vapor cleaning of small parts in plants throughout the country.

★ ★ ★

Details available from the manufacturer, Manpro Corporation, 1374 Hilton Road, Detroit 20, Mich.

Booklet on Aluminum Finishes

"Finishes for Aluminum," a new, handy-size reference containing latest information on the subject, is now available from **Reynolds Metals Company.**

★ ★ ★

"This 28-page handbook brings together the most advanced data obtainable on preparation and treatment of aluminum surfaces," according to **J. B. Kerr,** chief finishing engineer in Reynolds engineering services department.

★ ★ ★

Starting with cleaning treatments, the booklet explains theory and method for five major types of finishing operations—mechanical, chemical, anodic, organic and porcelain enamel—including their advantages, disadvantages and costs. Its aim is to provide information needed to select the best finish for a particular application.

★ ★ ★

Copies of "Finishes for Aluminum" can be obtained by writing Reynolds Metals Company, Dept. PRD-9, Box 2346, Richmond 18, Virginia.

Promoted by 3M

Promotion of **Edwin F. Goad** to marketing supervisor for coated abrasives and new products, coated abrasives and related products division, has been announced by **Minnesota Mining & Manufacturing Co.**

★ ★ ★

Mr. Goad, who joined 3M Company in 1950 as a coated abrasives salesman, was previously at the St. Louis branch office. In his new post he will make his headquarters at St. Paul.

NOW!... "CONTROLLED POWER" in ENJACO'S FEDERAL LINE COMPETITION GRADE SPARK TESTERS!

CLASS K, UP TO 50,000 V., A.C.
CLASS M, UP TO 80,000 V., D.C.

This outstanding safety feature, formerly found only in our higher priced equipment, has now been incorporated in our economy models.

Advantages of "Controlled Power":

- 10-milliampere secondary current is automatically held constant through entire testing range . . . provides ABSOLUTE SAFETY FOR OPERATOR!
- 10-milliampere value is high enough to maintain correct testing voltage . . . low enough to prevent burning damage to insulation on fault location.
- Regulation to 10 m. a. short circuit current is automatically accomplished by manipulation of the testing voltage regulator knob ONLY!

CLASS L, UP TO 5,000 V., A.C.

ASK FOR CATALOG SECTION 3B

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THOMAS L. HOLMES, Vice President

100 GLEN ROAD, CRANSTON 10, R. I., U.S.A.
MAIL, P.O. BOX 3674 • PHONE HOPKINS 7-8411
CABLE "JALENCO" PROVIDENCE

WESTERN REPRESENTATIVES:
Paul I. Kenner Co.
230 Shaw Road
South San Francisco, Cal.

Spring Wire

(*Continued from page* 980)

goes from 21/64" to 3/64" or a spread of 18/64" in diameter. The largest single volume item is 16 gauge Spring Wire for our famous Beautyrest mattress which is 1/16" in diameter. We also use galvanized wire for Link Fabrics and Hide-A-Bed Canvas Wires. On some occasions we have used galvanized wire in mattresses for export use. All of the types referred to have been round wire. We also use flat wire (3/16" x .042) for borders in cushions. Some oil tempered wire in 13 gauge is used for balance springs on our Hide-A-Beds.

★ ★ ★

E. Classifications of Types Used —Our wire falls into the following classifications, and is so specified on our purchase orders, indicating the end use of the wire. This puts the responsibility directly on the Wire Mill to produce this wire to the proper specifications, including tensile strengths, etc., as prescribed by the American Iron and Steel Institute. Simmons Company has adopted some exceptions to the A.I.S.I. specifications, those being on our bright low carbon wire for link fabrics where we have gone down a few points on tensile strength but have not gone to an annealed in process wire, and on our 15 and 16 gauge Spring Wires for Beautyrest mattresses where we have gone up on tensile strength to obtain better load carrying results. These special specifications, written by our Engineering Department, are on file with the Mills, on a national basis. We classify our wire as being: Border Quality, Crimping Quality and Link Fabric Quality in the low carbon wires, and Knotting and Coiling Quality, Common Lacing Quality—for helicals, and Beautyrest Quality in the high carbon Spring Wires.

★ ★ ★

F. Uses —

1. **Low carbon wire is used for: Borders, crimps and crimping including some annealed in process bright basic, Link Fabrics, and Canvas Wires for Hide-A-Beds which is a galvanized hard basic.**
2. **High carbon wire is used for: Borders on cushions, including the flat wire; stabilizers; coils—knotting and coiling type, and for the Beautyrest—barrel type; helicals—open or closed hook—regular or right angle; helicals—pigtail type.**

★ ★ ★

G. Quality Control — Quality is the watch word throughout the Simmons Company. In order to give quality in our finished products, we must insist on quality workmanship and on quality raw materials, including wire.

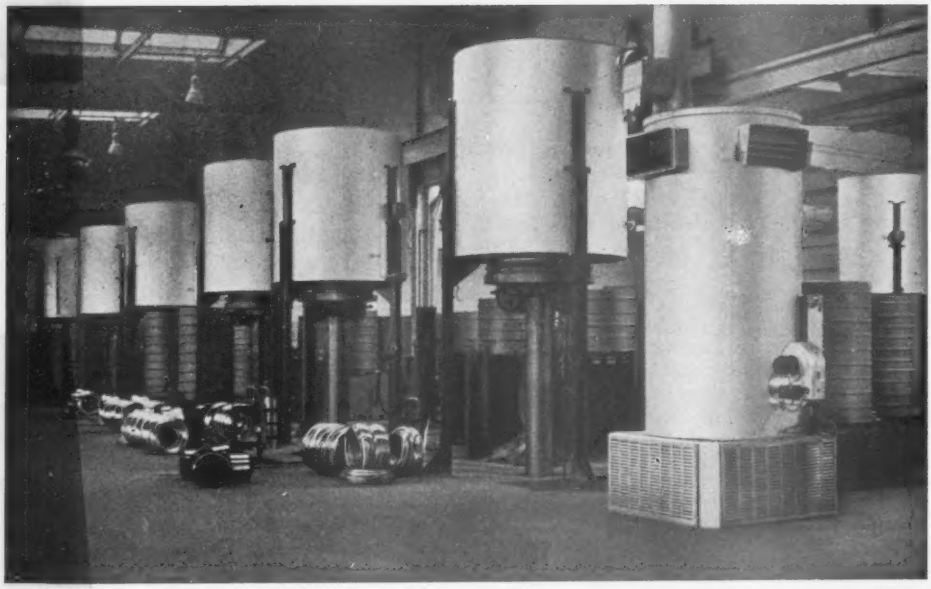
★ ★ ★

We work very closely with the Sales Metallurgists from the Mills through our Purchasing Department and also our Engineering and Production Departments.

★ ★ ★

As a result of many years of very fine associations with these people we have arrived at a common understanding of the quality of each type of wire used that we must have for our operation. Many

THE LAST WORD IN MODERN, EFFICIENT DESIGN!



SEVERAL VACUUM BRIGHT ANNEALING UNITS WHICH WE HAVE INSTALLED IN ONE OF THE MOST PROMINENT CABLE WORKS IN GERMANY

(German and Foreign Patents)

★

SOLE REPRESENTATIVE:
PAUL REICHER
Machinery & Equipment
P. O. BOX 127
Willowdale; Ont., Canada

OFENBAU **FRITZ** G.m.b.H. & Co. K.G. **HAGEN,** (W.-GERMANY)

of these mutual understandings are far better than anything that can be found in writing in either the A.I.S.I. or any other text books. In other words, there is no substitute for personal contact and the meeting of the minds that results therefrom.

★ ★ ★

We run special tests on sample coils from each shipment of Beautyrest wire by actual operation on properly adjusted machines at the time the shipment is received. In addition we run weekly checks on fabricated coils on a properly calibrated scale to check the weight carrying ability of the coils or if anything looks suspicious while running the wire these checks will be made at that time. We also send our National Engineering Department sample fabricated coils and strands of wire picked at random right from the machines once per month for them to run all possible known tests for quality of the wire that might in any way effect our finished product.

★ ★ ★

Once a month U.S. testing laboratories will write to any accredited Simmon dealer for a new mattress to be taken out of their stock for a complete check in specifications including the wire coils.

★ ★ ★

At any time when we feel that any type of wire that we are using is not quite up to standard, we set that lot aside until we can have it checked to determine whether our suspicions are founded or not. After the wire has been checked, proper disposition is then made depending upon the results of the tests.

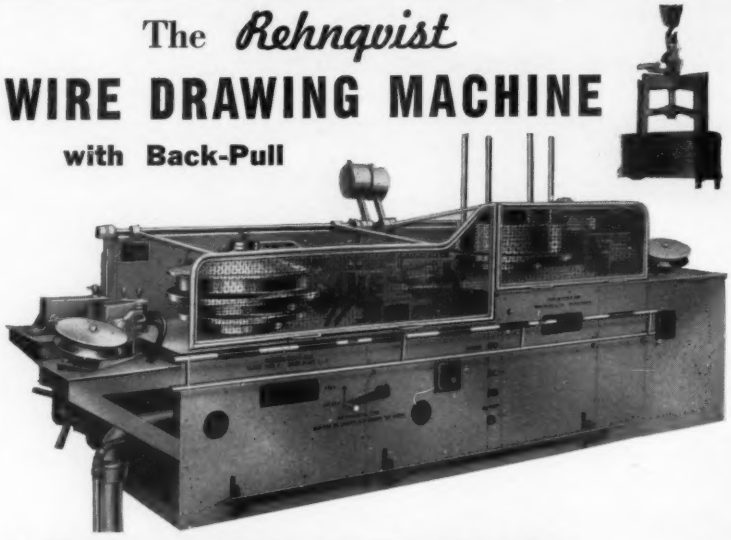
III. Summation

In this type of talk I do not believe there is much of a summation necessary. The most important point is to have a proper understanding between the producer and the user.

The *Rehnqvist*

WIRE DRAWING MACHINE

with Back-Pull



A NEW CONCEPT OF EFFICIENCY

Counterdrawing, or back-pull, increases die life and consumes less power.

While good for any wire, these machines are especially efficient in drawing Stainless, High Carbon and Resistance Wires.

A single motor drives the machine, different blocks being connected by gears operating through differential gears. Important feature of the differential is the automatic adjustment of all blocks to each other to maintain tensions without slippage. Wire runs from block to block with no accumulation or twisting.

All dies and blocks water cooled. Pneumatic controls stop the machine if reel trouble develops. Full safety features to highest standards built in. Construction is heavy for long service. Finishing block supplied in diameters required for your operations. Machine occupies floor space of 12′ by 9′ overall. Motor is 85 hp, 2-speed AC, 865/1730 rpm. 4-speed gear box gives 8 different speeds of from 108 to 1380 fpm.

Get the facts on these remarkable machines.

Write or Telephone

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ATLAS POLAR COMPANY LIMITED

POST OFFICE BOX 160 TORONTO 16, CANADA

Tel.: Plymouth 7-3641

Signal Corps Schedules Symposium

The 8th Annual Wire and Cable Symposium, sponsored by the **U. S. Army Signal Research and Development Laboratory,** will be held on December 1, 2 and 3 at the Berkeley-Carteret Hotel, Asbury Park.

★ ★ ★

As in the past, some 25 technical papers will be presented showing the progress during the preceding year in the field of communications wires and cables.Heading the Symposium Committee this year is **Howard F. X. Kingsley** of the Signal Research and Development Laboratory.

★ ★ ★

Also on the committee are **F. W. Wills,** of USASRDL; **Ray Blain,** USA Signal Engineering Agency; **C. T. Wyman,** Bell Telephone Laboratories; **J. L. Robb, Superior** Cable Corp.; **Benjamin Levinson,** the Okonite Co.; **I. T. Stoneback,** I. T. & T. Laboratories, and **H. L. Wuerth,** B. F. Goodrich Chemical Co.

Fine Wire Cloth

Finely woven wire cloth, with as many as 300,000 openings per square inch, is now produced commercially in pure nickel and Monel nickel-copper alloy.

Plating of Wire and Wire Products The Kanigen Process

(*Continued from page 978*)

than hard anodizing on an aluminum tape recorder pulley. Heat treatment increases the frictional properties also. Its non-galling characteristics against steel and chrome make it readily adaptable for preventing the galling in stainless steel threads.

★ ★ ★

Because Kanigen deposits are non-porous and because Kanigen—due to its phosphorous content — is less electronegative than pure nickel, Kanigen gives much better corrosion resistance than electroplated nickel. To assure a pore-free coating, recommended thicknesses vary with the surface roughness. Thicknesses also vary with the extent of the corrosive conditions. With anodic coatings like cadmium and zinc on steel, the galvanic protection afforded the base metal varies directly as the thickness of the plating. When these anodic coatings are completely sacrificed, the base metal corrodes. With noble coatings as Kanigen on steel, protection varies with the degree of porosity.

★ ★ ★

Kanigen is particularly corrosion resistant to atmospheric and alkaline conditions and many organic solutions. It is also used to prevent iron contamination in the food and soap industries as in conveyors for soap, peanut butter and instant coffee machines. Strong acids or organic acids are not recommended. In questionable applications, testing of samples is strongly recommended.

★ ★ ★

The adhesion qualities of Kanigen are quite good, particularly on steel where values of between 30,000 and 60,000 pounds per square inch are reported. Adhesion is regularly tested by bending sample coupons 180°. The existence of flaking indicates poor adhesion, which is generally the result of poor cleaning.

★ ★ ★

Kanigen's even and closely controlled deposition is like a plater's dream come true. In electro-deposits, the thickness of metal deposited is proportional to the current density in any given area. Deep recesses or bores in a piece will receive relatively little or no plating unless complicated and expensive anodes are constructed to give a more uniform current density over the whole piece. With many irregular shapes it is economically impossible to obtain deposits which are uniform within 100% variation and even then, the thickness in a given area cannot be closely controlled. With Kanigen plating the deposition is uniform within plus or minus 5% wherever the bath touches the work piece. In electroplating a bolt, plating will build up faster on the crown of the threads than in the valleys. This means that to achieve a minimum corrosion resistant coating in the valleys, the crowns will have to be plated excessively, which in many cases, will throw the pitch diameters out of tolerance. The uniform deposition means that the surface finish of the base metal is duplicated exactly. Also, the plating thickness has been controlled within plus or minus 50 millionths of

The PESCHEL line

ELECTRICAL TEST EQUIPMENT FOR THE Wire Industry

200 KV rms
Typical High Voltage Tank Section

For full-reel dielectric testing, Series "K" High-Voltage AC Test Sets are available in various voltage and various KVA capacities, to meet ASTM, IPCEA and MIL standards. Features: high KVA capacity, low waveform distortion and low corona level; metering directly at high-voltage for highest accuracy; complete safety and convenience controls. Separate control cabinet (not shown) for remote operation. Free literature sent. Other dielectric, DC Overpotential Testers, Corona Test Sets, Cable Fault Locating Sets, and others. Also a line of improved Sparkers, DC or AC.

PE PESCHEL ELECTRONICS, INC.

TOWNERS, NEW YORK (Putnam County) Tel: TRinity 8-3251

an inch on a production basis on one electronic's part.

★ ★ ★

Sample coupons are measured periodically to give the rate of deposition. The fact that the deposition is uniform and closely controlled and that the base metal finish is exactly duplicated enables us to obtain a finished article after plating without additional machining and finishing. This has enabled us to salvage electronic and missile parts costing over $700.00 and involving over three months labor.

★ ★ ★

The surface appearance of Kanigen depends on the base metal. It can be polished to a reflectivity of about 60% with a somewhat darker appearance than pure nickel. Buffing is relatively easy but polishing to remove plating and smooth rough areas is extremely difficult due to the hardness of the coating. The desired polishing should be done prior to plating. By varying the content of the stabilizing agent added to the bath, plating can be varied from extremely bright to a dull matte finish.

★ ★ ★

Kanigen can be coated over a wide range of base metals including:

wrought iron—nuts and bolts, wire racks
cast iron—meter, regulator and pump castings.
copper—microwave tube parts, waveguides, screens
steel—springs of low flexure
brass—ball point pen refill capsules, rods, heat exchanger tubes
bronze—impellers
aluminum—automobile bumpers, handles for shavers.
magnesium—missile cone sections, flywheels
titanium—missile parts
beryllium—

★ ★ ★

Zinc, lead, cadmium, tin, bismuth and antimony cannot be coated. Normally they act as poisons to the bath thus preventing plating or causing poor plating.

★ ★ ★

One of the unique properties of Kanigen is its ability to plate almost anything including thermosetting plastics, glass and ceramics. This unique property is a mixed blessing as it often plates the whole plating system as well as the work in it. Kanigen is, therefore, particularly adaptable to printed circuitry.

★ ★ ★

Solder wets the surface of Kanigen readily. For this reason it is finding increasing use on aluminum and magnesium in the electronics and missile industries where light weight and solderability are important. It bonds readily to rubber providing a good basis for bonding solid rubber tires to a metal rim. Other special applications include use as a maskant in heat treating processes, improvement of the wetability and wear resistance of printing mats and the releasing qualities of plastic molds, etc.

★ ★ ★

Preparation for Kanigen coating is similar to the steps required in electroplating. First, parts are masked if necessary. However, masking is to be avoided if possible since masking generally costs more than plating on the same area, also, the high temperature makes masking with normal materials difficult. Parts must be racked to prevent the formation of gas

Smart way to start
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The NORBIDE* abrasive this operator is using assures extra efficiency plus extra economy in refinishing wire drawing dies. Next to diamonds and diamond dust this Norton-developed grain is the hardest manufactured abrasive commercially available — yet its cost is 300 times less than sized commercial diamonds.

Get more facts on how NORBIDE abrasive can bring top performance and steady savings to your own die refinishing operators — including ripping, semi-finishing and, often, finishing. For details and prices write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

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pockets which stop the plating. Parts can either be coated in a plating barrel or hung on racks. Parts coated in a barrel exhibit the same uniform thickness as those plated on racks. Parts hung on racks do not have the contact areas which are void of plating, typical of electroplating. Parts coated over .001 inches will exhibit a variation in the plating where they contact the racks, but unless the parts are extremely heavy there will be no voids in the plating. Many Kanigen plants are equipped to jig-plate large pieces, too.

★ ★ ★

As in electroplating, the pieces must be absolutely clean to assure pore-free adherent coatings. Greases and oils are removed by vapor degreasing and emulsifying solutions. Carbon and other soils are removed by periodic reverse in alkaline cleaners, molten salt baths or chemical etchants. Oxides are removed by grit or sand blasting, vapor blasting, molten salts, bright dips or acid pickles. Each cleaning procedure is dependent upon the oxides and soils to be removed and the metals to be plated.

★ ★ ★

The Kanigen process can solve many wire products coating problems. It should not be used indiscriminantly, but where properly applied, it can yield great savings. General American Transportation Corporation and its licensees would enjoy discussing the applicability of the Kanigen process to your coating problems.

The West Coast Regional Meeting of The Wire Association

(*Continued from page* 981)

Regional Meeting were the following men:

Chairman

Lloyd W. Albright
The Colorado Fuel & Iron Corp.

Members

V. A. Barbata
Bethlehem Pacific Coast Steel Corp.

J. F. Hawley
E. H. Edwards Company

W. H. Fish
The Colorado Fuel & Iron Corp.

D. H. Kofahl
The Colorado Fuel & Iron Corp.

R. W. Payne
Columbia-Geneva Steel Div.
United States Steel Corp.

R. L. Noble
The Colorado Fuel & Iron Corp.

★ ★ ★

The foregoing gentlemen formulated an excellent program of papers and events, well repaying all who attended for the time spent in San Francisco.

★ ★ ★

The two days were perfect, temperature and weather-wise, adding considerably to the enjoyment of the meeting.

★ ★ ★

Our gratitude and thanks to the Program Committee for their fine work and its gratifying outcome.

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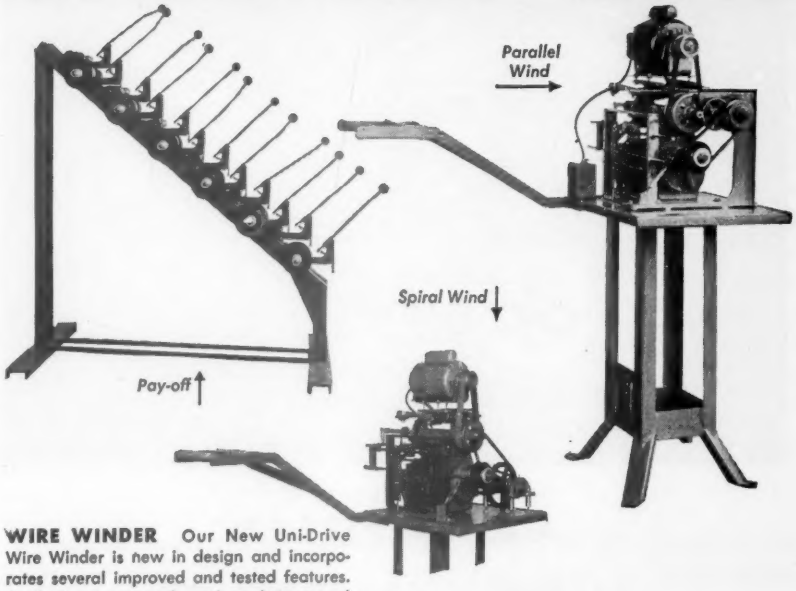
STANDARD UNI-DRIVE WIRE WINDER



WIRE WINDER Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAY-OFF Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

STANDARD MILL SUPPLY COMPANY
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

Borax in the Wire Drawing Industry

(*Continued from page* 969)

3. Spring Wire

Borax coatings are used on spring wire under 0.054″ diameter.

★ ★ ★

For larger wire, Borax coatings are not as satisfactory as the coating is not quite as flaky as the forming machine demands. It is hoped that this difficulty can be overcome in the near future to allow the use of Borax coatings on all spring wire. This is especially desirable as Borax coated wire handles so easily in the induction heating units used for tempering.

4. Wire for Coat Hangers

Wire for this purpose is often grease-drawn to leave a clean finish which will require no cleaning prior to painting. Some firms have also reported the satisfactory use of an alkali type lubricant carrier for this purpose.

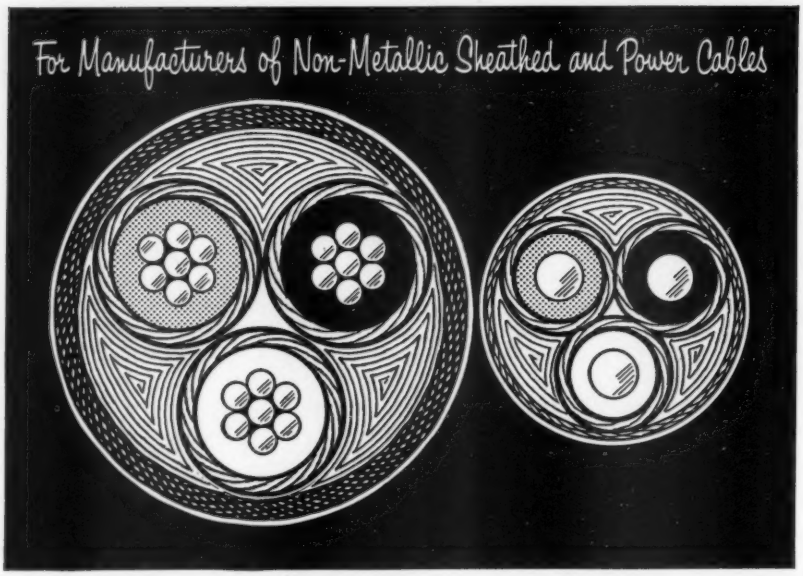
Future Practice

Refinements and improvements in wire drawing procedures will no doubt be forthcoming in the years ahead.

One of the problems now facing the industry is that of waste disposal of spent acid. The seriousness of this problem is such that it now appears possible that some form of mechanical descaling will gradually replace the acid cleaning process. Use of mechanical descaling methods will, of course, eliminate the necessity for acid neutralization.

★ ★ ★

As acid neutralization is only one of the many benefits to be derived from the use of Borax coatings, however, the trend toward increased use of Borax in the wire drawing industry is expected to continue. Borax coatings will continue to be used as excellent lubricant carriers and to prevent corrosion during storage periods between cleaning and drawing. The many extra benefits derived from Borax and enumerated in a previous section will also continue to be realized.



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PLYMKRAFT DIVISION
Plymouth Cordage Company, Plymouth, Massachusetts

In-Line Processing of Rod to Wire For Cold Heading

(*Continued from page* 951)

Neutralizing and Drying

As the final step in the chemical process, the rod passes through a neutralizing solution bath, heated to approximately 200° F. This bath neutralizes any residual acidity remaining after coating. We have found that an approximate 8:1 ratio of Parcolene No. 21 and Bonderlube No. 235 is most effective for this purpose. The Bonderlube adds some lubricating qualities to the neutralizer.

★ ★ ★

The excess neutralizer is then removed and the rod dried by passing through an air blowoff.

Wire Drawing

The rod then passes through a dry soap compound which is absorbed into the coating and acts as a lubricant in the drawing and heading operations. The compound must have the proper lime-soap ratio and the right particle size.

★ ★ ★

The rod is drawn into the draw-

ing die with the bull block or dead block. The approach or entrance angle to the die is quite important. In general, flattening of the entrance angle tends to draw the lubricant and coating through the die instead of scraping it from the surface. Retention of the lubricant is beneficial for subsequent heading operations. We have found that an included die angle of from 15 to 18 degrees serves best for this purpose.

Wire Recoiling and Storage

On our initial line, the wire is recoiled on a horizontal plane by the bull block. This bull block can coil approximately 300 to 600 pounds at one time. Accordingly, when this amount has been drawn, the line is stopped and the drawn wire cut by a Manco guillotine shear. An overhead hoist then lifts the coil off the bull block reel and places it on a high hat for storage until needed.

* * *

On the new line, a Morgan dead block automatic stripping machine will be used. This unit is designed to coil the drawn wire around an "elephant's trunk," from which it drops automatically onto a high hat. This unit should enable us to have continuous coils of up to 5,000 pounds on a single high hat. Moreover, by blocking off the discharge end of the "elephant's trunk," the completed coil can be sheared free and the loaded high hat replaced with an empty without stopping the unit.

Special Boltmaker Line

As mentioned earlier in the report, we have also constructed a third processing line, one feeding directly to a Boltmaker. We consider this setup to be close to the ultimate in automation. (See Fig. 5)

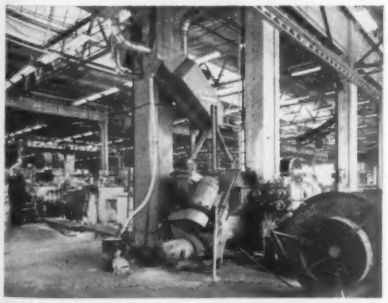


Figure 5

The material is delivered to the unit as hot rolled rod, and leaves as a finished bolt without intermediate handling. All operations are performed by the Boltmaker operator.

* * *

The rod coils are loaded on a special rack, designed so that rods can be payed off one end while new coils are loaded on the other end.

* * *

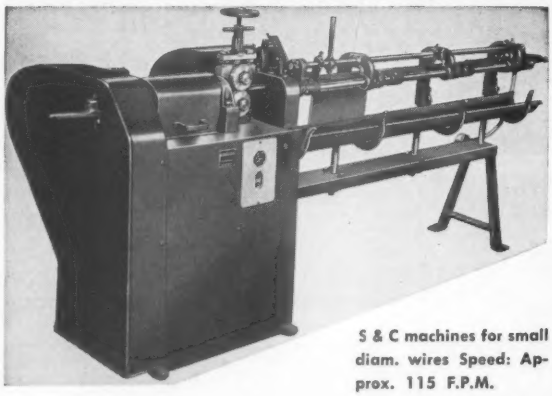
The coils are not butt welded together. Succeeding coils are inched into the line by powered straightening rolls located just in front of the rack.

* * *

The shot blasting unit is a standard Wheelabrator cabinet, operating the same as the units described on our other two lines. It is, however, equipped with special guides to insure proper feed of the free coil ends through the blasting pattern.

* * *

New! Improved! Fast!
WELLS STRAIGHTENER & CUTTER



S & C machines for small diam. wires Speed: Approx. 115 F.P.M.

This completely redesigned line combines maximum efficiency with that rugged dependability, for which WELLS S&C machines have become justly famous.

Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.

FEATURES

The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.

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The Standard of the Wire Industry

The processing stages in the coating line are the same as those previously described. However, the entire unit is self-contained and only twelve feet long. All stages are designed with thirty degree lead-ins to insure proper feed of the coil ends. The Bonderite section is designed to give fifteen seconds immersion time at the maximum stroke and speed of the Boltmaker.

★ ★ ★

The descaled and coated rod is then drawn to size in an Ajax Hogue wire drawer and fed directly into the Boltmaker proper.

Conclusion

To date, we are highly pleased with the progress that has been obtained with our present in-line rod processing units.

★ ★ ★

Most phases of the initial line were redesigned and either rebuilt or replaced by our Engineering and Mechanical people as different problems arose, until today we feel our units are performing satisfactorily and producing cold drawn wire superior in quality with costs approaching those incurred when conventional cleaning and drawing equipment is employed.

★ ★ ★

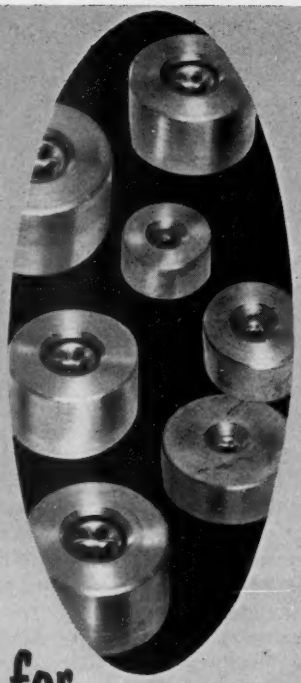
Due to the recent addition of our second primary line, which is being operated in conjunction with the original line, our conversion costs should decrease further. This cost reduction is achieved by using the same work force to run both primary lines.

★ ★ ★

The prototype direct in-line rod processing equipment used with our ¾" Boltmaker has shown promise, and in the future we may equip other large machines with like units.

★ ★ ★

The economic justification of an installation such as ours as opposed to conventional acid cleaning and batch coating facilities is, of course, dependent on local circumstances. Equipment suppliers are happy to furnish figures on the cost of oper-



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HYPREZ DIVISION
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ation of their units. Material handling costs will vary from plant to plant with the method of handling employed and the distances materials must be moved. The capital expenditures become apparent as equipment layouts are made.

★ ★ ★

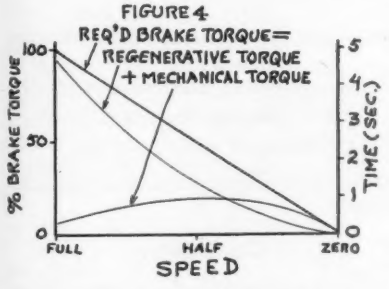
Factors which bear on the matter but cannot be readily assigned a dollar value are tool life, machine down time, and regulations concerning the disposal of waste acids.

De-Bugging Electronic Controls

(*Continued from page* 967)

brake that we would get what we wanted. So we did just that. We set the electric regenerative braking to take care of the initial stopping cycle and set the mechanical brake to take care of the final stopping cycle. The result: a spooler system where constant tension prevailed over the whole braking cycle, with the festoon arm hardly moving off its running tension position. (See Figure 4).

FIGURE 4



Is production happy? The first day they looked upon it as an accident. Maybe the controls just had a "good" day! But, as day after day went by with no trouble and high production, the worth of our "Rube Goldberg" control scheme became more prominent. Now the machine is accepted as "in production".

Conclusion

This article is not being written as a condemnation of electronics in industry. There is no doubt that further research could have located the inherent troubles with the electronic circuiting. We are still not satisfied that stability could have

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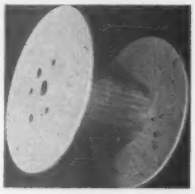

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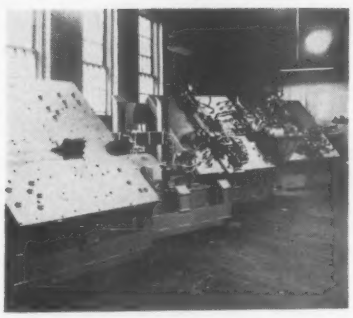

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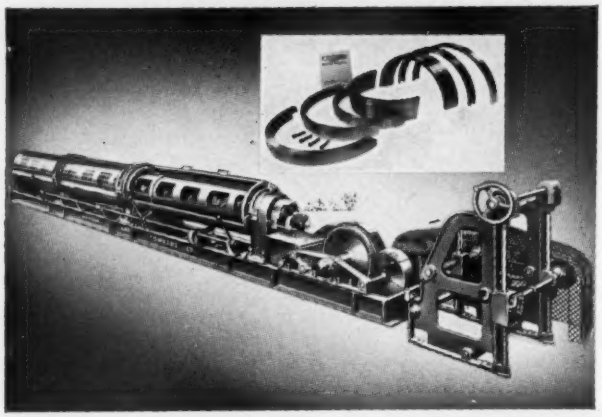

THESE MACHINES HAVE ROTORS THAT RUN IN LARGE **SPLIT ROLLER BEARINGS,** SHOWN ABOVE—NOT ON SUPPORT ROLLERS—GIVING HIGHER SPEEDS, SMOOTHER RUNNING, AND LOWER MAINTENANCE COSTS.

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been introduced and certainly simplicity would not have been improved.

* * *

Our questions are: "Was all this electronic equipment necessary? Were we using components that had questionable reliability? And, are electronic specialists invading a field where basic fundamentals are being overlooked? In summation, are we approaching the solution of control problems as problems that require scientists and specialists, or should we first try to solve them with good logic, using proven methods and reliable equipment?"

* * *

There are other ways of solving these problems than are listed in this article. However, we now have a drive that does what our management wants it to do. It produces good wire at the predetermined rate of speed and does it day in and day out. Furthermore, the electrical engineering department can go home at night and figure on a whole night's sleep.

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CHAMBERSBURG, PENNSYLVANIA
ATLANTA • CAMBRIDGE • CHICAGO • CLEVELAND • DALLAS

New Extrusion Techniques With Silicone Rubber

(*Continued from page* 962)

gated is caulking gum type applications.

Conclusion

The early years of silicone rubber were, for the suppliers, those of self education in polymer research and development. The more recent years have been marked by notable improvements in the physical properties of elastomers themselves.

* * *

The latest developments, presented here today, are those of improved processability and fabrication techniques. This technology has been extended to other wire and cable specifications, such as Mil W-8777, Mil C-21941C, Mil W-16878, and individual end-user specifications, and it seems only logical to expect these same processing advantages to appear in a family of solvent resistant, organo-silicone

elastomers as well as other areas of future utility in the wire and cable industry.

Advanced Lubricants and Pressure Dies for Better Wire Drawing

(*Continued from page* 953)

heads filled out nicely, whereas other bundles, out of the same pin of rods, were not meeting mill inspection. A review of this operation showed that slots of 3/8 x 3/8 x 1/8, with all meeting points broken over and a hole size of 11 percent average over rod size, provided the most uniform lubricant film.

★ ★ ★

Continuation of this operation has shown its full value, both in the wire and the nail mill.

★ ★ ★

We then arranged to set up similar operations in other mills. It was found that in two cases the specific design of pressure dies did not yield the results formerly experienced and variable other designs were tried. Again, by the use of either three, four or no slot pressure dies, used in conjunction with the ripper only, excellent results were obtained. During these tests, we examined the value of pressure dies when used on mechanically descaled rods and also lime coated and borax coated high carbon rods.

★ ★ ★

On two operations, drawing .120 prestress strand wire out of both .281 and .250 heavy double limed rods, tonnages per shift were increased two and one-half times the former amount. Die life was at least tripled and tolerances were maintained at plus or minus. 00025. On this operation, a pressure die was used with the ripper and one of the new E. P. lubricants was used as the drawing vehicle.

★ ★ ★

Another application of the pressure die was made on double Lead Patented Wire, borax coated, where the pressure die was used in each pass. Again a hole size of 11 percent over the stock size was used. This was a five hole operation and, after running this job three months, an increase in W. A. Yield of over

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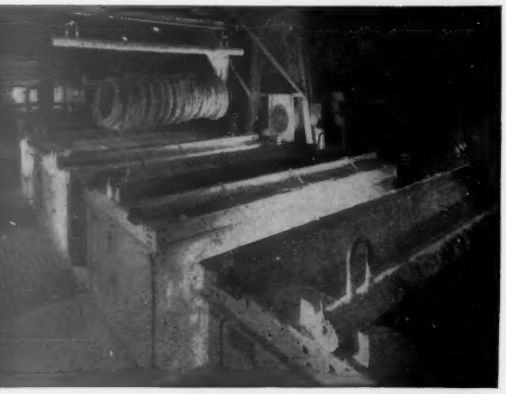

Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

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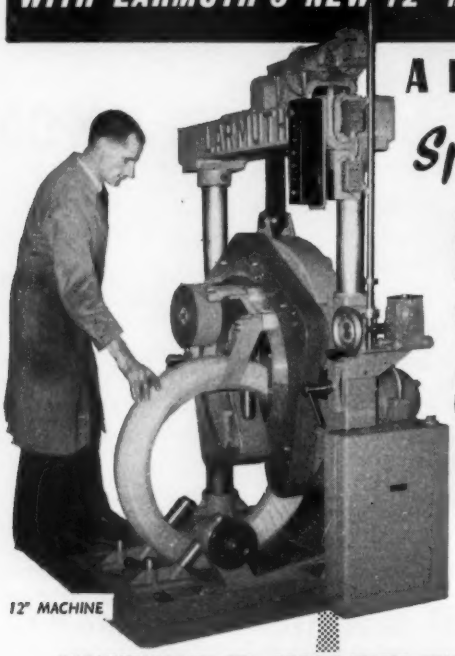

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seven percent was noted. Without pressure dies, twice the number of dies were used. The application of pressure dies also eliminated the necessity of allowing the borax coating to age for several days. A conventional lubricant, slightly increased speeds and regular mill reductions were followed.

* * *

Another application of the pressure die was made on High Carbon 7/32 Rod, both air and lead patented, borax coated. This was a five hole .091 — 13 ga. — operation. Again the pressure die was used in all passes and again the die usage was less than half the normal figure and the yield increased substantially. On this job the standard reduction and conventional lubricant were used. Many other designs were evaluated and, generally speaking, the designs as shown on the slides are in daily use — with excellent results. It is well to note how in one case a six slot design was proven to be most superior after evaluation of a two, three and four slot design were completed.

* * *

Limited tests were conducted on the drawing of warm Heading Wire where the heading operation was extremely critical. A pressure die and a new type synthetic E. P. lubricant were used on this operation. Preliminary results were very encouraging and in the near future this project is to be resumed.

* * *

Tests were also conducted, drawing Prestress Concrete Wire, Upholstery Grade Spring Wire, wire to be oil tempered and several other types of wire. The use of extreme pressure lubricants and the pressure die were definitely beneficial.

* * *

Conventional lubricants used with pressure dies, as noted previously, were evaluated and in certain cases, they were found to be completely satisfactory The use of E.P. lubricants has not always been confined to an operation where a pressure die has been used and results on these operations have shown marked improvement when comparing the drawing and tonnage results of the E. P. lubricant versus

a good conventional lubricant.

★ ★ ★

It is interesting to note that R-6 ripper dies with an included approach angle of 12 degrees, bearings of 25 percent and full back relief were found to be generally the most satisfactory when drawing out of a High Carbon rod at accelerated speeds.

★ ★ ★

Where extremely close tolerances are necessary and conventional lubricants did not permit both maintaining these tolerances and peak tonnage, the use of a pressure die — ripper combination and E. P. lubricants provided a tonnage increase of two and one-half times the former average and increased die life by twice the normal expectancy.

★ ★ ★

The uniformity of lubricant film resulting from the pressure die ripper combination, shows appreciable savings in the Wire Drawing Dept. and savings in many other intra-plant operations have become apparent. Customer's operations in many instances may be appreciably improved.

★ ★ ★

The only common factor seems to be the hole size of the pressure die and a figure of approximately eleven percent over the diameter of the rod or wire being ripped is most successful. An example would be a hole size of .280 — .300 on a .250 rod. Too small an opening causes the holder to break and too large an opening does not give the desired result.

★ ★ ★

The use of extreme pressure lubricants and pressure dies has been largely confined to the ripper, however, it is quite possible that utilization of pressure dies and E. P. lubricants in the intermediates and finishers could produce even more interesting results, as indicated in some of these examples reported.

★ ★ ★

In conclusion, there is hardly anything produced today which is not subject to outside competition, subsidized industry, cheap labor and the resulting cheap selling price. This necessitates our every effort being put forward to over-

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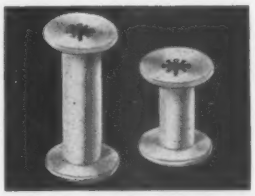

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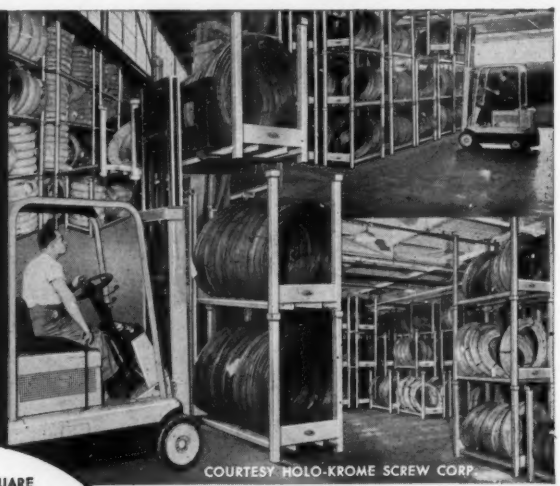

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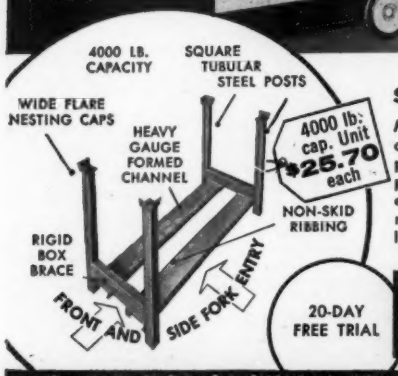

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The Houston Regional Meeting

(*Continued from page* 959)

the many places of interest in and about Houston had been arranged by the Program Committee. This included the downtown district, residential areas, medical and educational institutions, parks, Houston's "Land of Millionaires"—River Oaks, and other points. The city, with over 800 thousand population, has been dubbed the "South's First City."

★ ★ ★

The men responsible for the fine program of papers and events were **William L. Dull,** Superintendent of the Wire Mill, who was Chairman of the Program Committee, and **K. P. Campbell,** Works Manager, who served as Co-Chairman. Both men, of course, are with the **Sheffield Division** of the **Armco Steel Corporation** at Houston.

★ ★ ★

They did a fine job of planning and execution and deserve the gratitude and thanks, not only of those who attended, but of all steel wire men who will benefit from the reading of the technical papers that provided the occasion for the meeting. These are published elsewhere in this issue of Wire and Wire Products.

Firth Sterling Elects Two Directors

Kenneth D. Mann, president of **Firth Sterling, Inc.,** Pittsburgh, Pa. announces the election of two additional members to the board of directors of the company.

★ ★ ★

James L. Lewis of Rye, New York and **R. K. Hopkins,** recently elected a vice president of Firth Sterling in charge of the specialty alloy steel operations, formerly owned by **The M. W. Kellogg Company,** were elected at the last meeting of the board of directors.

The Production of High Carbon Steel Wire

(*Continued from page* 958)

case of acid embrittlement.

★ ★ ★

In the wire drawing operation, any of a number of basic types of machinery can be used. We like to draw the analogy that the action occurring in a wire drawing operation is similar to that which occurs in the nozzle in the end of a fire hose, with the exception that instead of pushing, the material is pulled. Actually, the design of the wire drawing die itself is not too far removed from the design of the nozzle. In the drawing operation, the patented and cleaned wire passes through a powdered soap material which is referred to by the trade as a lubricant and then through the wire drawing dies. A look at the material and actually feeling it, doesn't reveal any great amount of lubricity so we like to say that we put the least objectionable material we can between the die and the steel wire and hope the two never meet. When they do, we have trouble in either worn out dies or scratched wire.

★ ★ ★

Generally, .70 carbon, .70 manganese steel directed either to rope wire or tire bead wire, is prepared as previously described and drawn to finished size by drawing through 6 or 7 individual wire drawing dies. The total overall reduction in area is between 82 and 87%. It is in this area of total overall reduction that the most uniform combination of tensile, torsion and bend seems to occur.

★ ★ ★

The first two are the inspection criteria for rope wire and tire bead wire. Bends are a requirement used some places in the evaluation of rope wire. The material for furniture spring wire is drawn in much the same fashion as rope material although the number of individual drafts may be decreased as may be required by the desired tensile of the finished product. The .80 carbon, .70 manganese steel used for the large sizes of rope wire and for prestressed concrete wire, may be drawn from as little as 60% and

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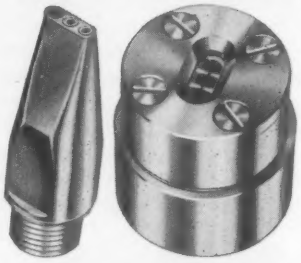

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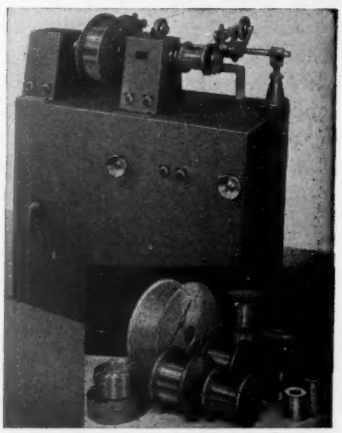

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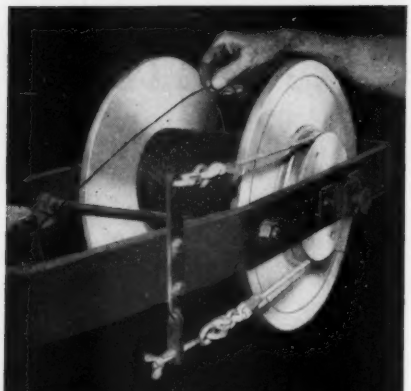

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up to 83% overall reduction in area. The individual drafting practice is for lighter drafts on this higher carbon material.

★ ★ ★

For inspection of the finished wire, samples of the material are tested for tensile, torsion and size. The degree of sampling should be determined on the basis of individual experience.

★ ★ ★

If we accept the idea that in continuous wire drawing operations the front end of one coil is separated only by chance and the cut of the wire drawer's pliers from the back end of another coil, that between the front and back end of a coil of wire, there can be literally thousands of feet, 100% testing other than for size, is not possible. In addition to the tensile and torsion requirements that are present for rope wire and tire bead wire, there may be reduction of area requirements, wrapping requirements, and knot or kink tests applied for spring wire specifications.

★ ★ ★

In our wire drawing operation we seem to be going through as much change in the method of application as the rest of the American industry has experienced. We are drawing at faster and faster speeds and putting wire into all manner of shapes and containers for delivery to the ultimate consumer.

★ ★ ★

In the wire industry, there have been a number of important milestones. They include:

The development of the idea of patenting high carbon steel;

The development of successful acid pickling;

The development of acid inhibitors;

The development of the Tungsten carbide dies (which, incidentally, is the only commodity or service in use in our plant today which is lower in price in 1959 than it was in 1939);

The development of successful lime substitutes; and recently,

The development of all the various types of wire packages.

★ ★ ★

These are all things on which our industry has been built.

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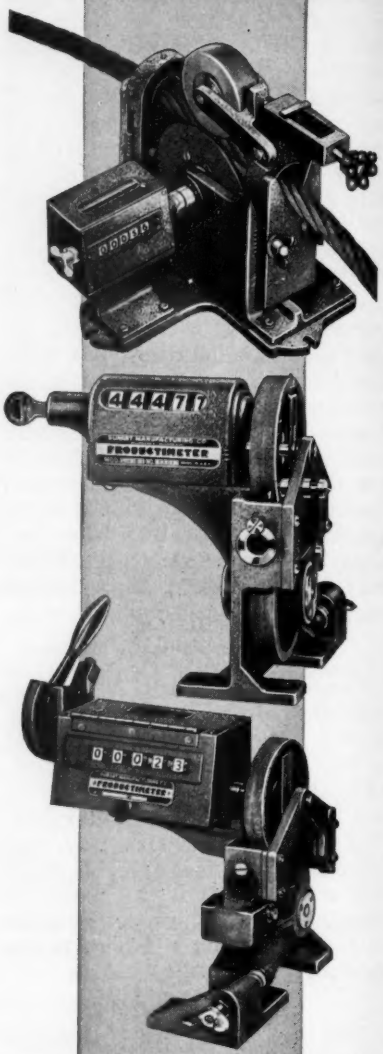

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If our industry is to continue to grow, there will need to be some breakthroughs into the unknown and the untried. In the field of rope wire — for that matter all small wire — the hot extrusion of a rod to a diameter of about size .120 in which a patented structure and scale free surface is present following extrusion, would be of tremendous impact. Someday we will have something like this.

★ ★ ★

This will require great advances in the field of wire drawing lubrication and wire drawing machinery. To approach automation, our tool, the wire drawing die, must increase its life many times above that which we expect today. The operation of more drawing equipment that is making it possible for a man to produce a more finished product, will be the result of these accomplishments.

★ ★ ★

If we, in the American wire business, are going to retain our position in our own country, as well as among the other nations of the world, our output per man hour must rise more rapidly and our quality of production and service right along with it.

★ ★ ★

We face a tremendous challenge today. Certainly we are up to it.

Heat Treatment of Rod and Wire

(*Continued from page* 973)

stressed concrete, stress relieving is employed to improve the elastic limit, to minimize creep of the steel under tension at the stress levels generally used, and to produce improved elongation properties. Stress relieved pre-stressed concrete strand or wire, by virtue of the aforementioned properties, offers an engineering design advantage over hard drawn wire of equivalent tensile strength.

★ ★ ★

Various techniques have been employed to effect stress relieving. Most of these are designed to uniformly heat the strand and/or wire to approximately 650 to 700° F. Pittsburg Works has recently installed the first induction heating facility for this purpose on the West Coast. This unit is designed to afford the maximum of control, thereby insuring absolute uniformity in physical properties. Attendant with the increase in elastic properties is an increase in the elongation value from a level of approximately 1½ to 2% up to 3½ to 6%. Prior manufacturing practices must also recognize a minor decrease in tensile strength of approximately 4%.

★ ★ ★

This has been a very brief description of the facilities and practices for the heat treatment of rod and wire at Pittsburg Works.

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The Production of Stainless Steel Wire

(*Continued from page* 957)

The search for ever-improved stainless wires for high temperature use and for high tensile purposes has in recent years produced whole new families of stainless wires, typified by Armco's precipitation hardening alloys, 17-7 PH, 17-4 PH, and PH 15-7 Mo. Because of their different modes of heat treatment and very special characteristics, modifications of wire mill practice have been necessary to meet their processing needs. The old familiar stainless heat treating and production practices do not always apply to these special high strength steels, and so, for the sake of progress, new techniques are being adopted. Wires that were once "annealed" for cold drawing are now "overaged" for best ductility and new routines of cold reduction and heat treatment have been installed to prepare them for subsequent aging, for the attainment of ultimate tensile strengths up to 320,000 to 350,000 psi at room temperature, and for use at high temperature levels and under corrosive conditions not practical for the earlier stainless wires.

★ ★ ★

So while the years have imposed on the stainless wire manufacturer new problems, more and narrower specifications, as well as a legacy of some old and unsolved problems, so also the years have provided a fund of experience, a substantial amount of progress, and the promise of considerable improvement in techniques and new materials for the future.

Impact of Equipment in the Industrial Fastener Field

(*Continued from page* 971)

in product is rapidly increasing. The demand for cold forged product in a larger and larger size range means additional major equipment expenditures. For example, cold forging equipment for 1" diameter material entails a minimum outlay of approximately one-

The conclusions to be drawn from these developments are not final, since the trend is not complete. However, certain general observations can be made which I believe would apply to any manufacturing industry:

1. **New manufacturing equipment which results in a greatly improved product is likely to create intense marketing problems. Therefore, such new equipment cannot be judged on operational or cost savings alone. Commercial aspect may overrule the cost considerations.**
2. **If such equipment happens to create an invasion or infiltration of other product into the standard product line, such as is the case of cap screws into the bolt field, or vise versa, the manufacturer must be particularly alert to the total change, not just the trend in the basic product itself.**
3. **A forecast of the timing of a trend becomes an extremely important factor for an individual producer. Today's mere symptoms may become a plague before equipment to meet the challenge can be obtained and put into operation.**
4. **Commercial forecasts must be strong enough and pursued vigorously to overcome the basic resistance to change and to keep a manufacturer abreast of progress in his industry.**

★ ★ ★

The most successful organization will recognize a trend early, will make the forecast and the decision to move, and will be adequately prepared for the challenge when it reaches its full proportion.

High Frequency Annealing

(*Continued from page* 964)

belt is another commonly known procedure, but this and the batch type furnace operation are cumbersome, slow and not economical.

★ ★ ★

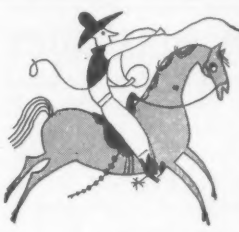
Many attempts have been made to perfect a method of continuous annealing of wire by passing it through a furnace. This method is expensive, there have to be many passes, and threading the wire through a hot furnace is difficult.

★ ★ ★

Engineers have tried unsuccessfully to attain quality product with the use of low frequency electric current, 60 cycle current passed through the filament to heat it by its own resistive losses. The most common procedure to effect a continuous annealing operation has been to pass the wire around a capstan with low frequency current introduced to flow through the wire from one capstan to another. The use of 60 cycle, or even 300 to 400 cycles current, in other than copper, is unsatisfactory due to the fact that arc marks occur on the surface of the wire as it leaves the capstan. These marks damage dies in subsequent drawing, and also make the product unsaleable for many uses.

Conclusions

The use of High Frequency Resistance heats metals faster and with greater consistency than any other known method and can be adapted to anneal wire on a continuous basis. Tests with the Thermatool unit over a period of two years and actual results in wire production lines attest to the accomplishments possible, and the advantages of High Frequency Resistance heating. This method also meets the speed requirements of modern wire production.



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WICKWIRE BROTHERS, INC. CORTLAND, N.Y.

The Shipping and Storage of Wire and Wire Products

(*Continued from page* 975)

determine the economics of equipment used to move and store material, space allocation, and the floor loading accessibility of fast and slow moving items. These are industrial expansion factors with which all industry must contend. Companies expanding production facilities should analyze the shipping and storage areas as carefully as they do on their producing machines. If this is overlooked savings may be made in the producing units only to have them wiped out in the shipping and storage areas due to congestion and lack of lift and moving equipment. The output of every machine should be studied with one thought in mind—can the product be shipped from that point without further excessive handling and packaging. This would be the ultimate in material handling and storage. In other words, the ideal setup is to have the drawing equipment feeding directly into the fabricating unit.

Heat Treating of Finished Wire and Wire Products

(*Continued from page* 976)

fatigue life by introducing compressive stresses which enhance the ability of such springs to withstand higher imposed stresses and longer cycle life. Normal surface imperfections caused by rolling or coiling which often result in early failure may be reduced and even eliminated by this procedure. For complete success we must use controlled shot peening in order to provide the correct intensity. This has been developed and is known as the Allman process.

★ ★ ★

Hard drawn straight carbon wire is popularly used for springs not requiring high stress resistance. Springs are also made of patented wire which is a wire pre-treated before the spring is formed or coiled. Heat treatment after coiling of either of these two types involves only a stress relieving operation to restore proper ductility. The temperature range employed for

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such stress relieving is 450 - 550 F. for a period of 30 minutes to one hour at heat followed by air cooling. Tempering operations both for stress relieving or to reduce hardness after quenching do not require a protective atmosphere as all such temperatures used are subcritical and do not result in either scaling or decarburization.

★ ★ ★

Where springs must have suitable corrosion resistance in acid environments, stainless steels such as SAE 302, having 18% Chromium and 8% Nickel can be used in the hard drawn condition. Here again we should follow the coiling with a stress relieving operation at a temperature below 600 F. A new stainless material gaining in popularity for spring applications is the 17 - 7 PH wire product. This material is furnished in what is termed condition A or annealed. The heat treatment involved requires a transformation temperature of 1400 F. for 1½ hours at heat followed by air cooling then aging or tempering at 900 - 1050 F. for 1½ hours followed by air cooling. The resulting hardness will be 42 - 44 RC. With this material, we have the advantage of high corrosion resistance along with sufficiently high hardness for spring applications. A second advantage is the fact that quenching is not required other than air cooling and therefore distortion can be held to a minimum value. The proper temper designation which covers the above treatment is TH 1000, 1050, etc.

★ ★ ★

Springs that must resist high temperatures in operation and yet retain their hardness are made of high speed steel. This has an analysis 18% Tungsten-4% Chromium-1% Vanadium and .72 Carbon. This material will retain its hardness after having been repeatedly heated to as high as 1000 F. Its hardness at elevated temperature is likewise much higher than with commonly alloyed spring steels. The heat treatment required involves heating to 2250 F. followed by air cooling to room temperature and tempering at 1250 - 1300 F. Time cycles of 2-3 hours is com-

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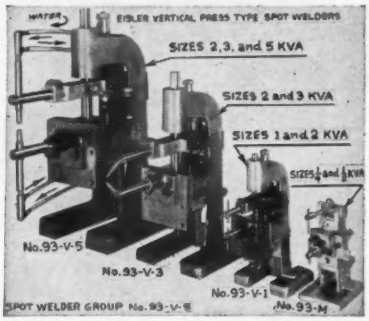

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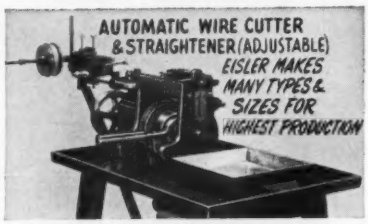

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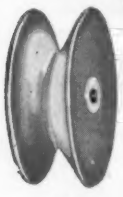

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monly used for the tempering operation. The same precautions of avoiding surface decarburization should be observed as with carbon steels. It is advisable to remove the as-rolled decarburization by centerless grinding prior to forming the springs.

★ ★ ★

Springs requiring materials for high electrical conductivity are often made of Phosphor Bronze or Beryllium Copper. The Phosphor Bronze does not respond to heat treatment and therefore must be used in the hard rolled condition. Beryllium Copper however can be aged to hardness values of 38-42 RC. This is accomplished by heating to 600 F. holding for 3 hours followed by air cooling. Very thin contact springs are often nested in a suitable fixture to provide dimensional control during the hardening operation. As in the precipitation hardening of stainless steels, the drawing raises the hardness and thus such materials are ductile prior to drawing and can be safely clamped for the aging process.

★ ★ ★

Clamping operations can be employed in straight carbon springs. However in this case it is necessary to first temper after quenching without the use of the fixture at 450 - 500 F. after which springs can be adjusted in shape by holding in the fixture and retempering at 600 - 800 F. This will produce a set in conformance with the fixture use.

★ ★ ★

The manipulation of temperatures related to both ferrous and non-ferrous materials provides a means of meeting a vast variety of mechanical and physical properties. In this most interesting field, heat treatment plays a vital role. A basic understanding of the response of materials used will enable both the supplier and the user to establish specifications properly to meet high performance standards.

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Copies are available free of charge. Write Anaconda Wire & Cable Company, Dept. EFL, 25 Broadway, New York 4, N. Y.

British Firm Arrives at Century Mark in October

Frederick Smith & Co., Wire Manufacturers Ltd., Halifax, England, will celebrate its centenary in October of this year.

★ ★ ★

Thomas Smith, father of **Frederick Smith,** started a business in 1806 making cards for carding wool. This prompted his son to enter the wire business in 1950 to supply wire for cards, and he joined James Royston's (now **James Royston Son & Co. Ltd.)** which had been making cards since 1797. His brother Matthew had already gone into the wire business in 1839 as a partner in **Sharp & Brown** at Tintern Abbey. Frederick soon became manager of the Royston mill and he remained there until 1859, when he left to establish Frederick Smith & Co., which became a limited company in 1897.

★ ★ ★

In 1864 Matthew left Sharp & Brown and joined Frederick as a partner in the enterprise, which was popularly known as the Caledonia Wire Mills. The company was one of the earliest to produce galvanized wire, starting this operation in 1865.

★ ★ ★

For a time the company drew both steel and copper wire at Halifax, but in 1898, moved its copper wire production to Salford. This business was merged with that of The London Electric Wire Co. in 1909, and is known today as **The**

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DESIGNED FOR LONG LIFE AND MAXIMUM WIRE PRODUCTION
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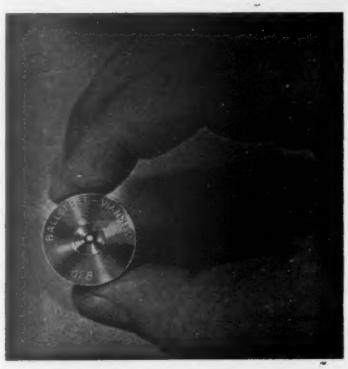
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London Electric Wire Co. & Smiths Ltd., which is operated as a separate entity.

★ ★ ★

Over the years the company has received many awards for excellence in the manufacture of wire and it enjoys a long and honorable reputation for progressiveness. One of the outstanding steps taken was the establishment in 1945 of the Staff School with the object of training executives and workers and maintaining an onward march of technical progress.

★ ★ ★

The Smith family is still active in the affairs of the company. **Clifford Smith** is the Managing Director, **Peter Smith** is Deputy Managing Director, and **George** and **Anthony Smith,** younger members, are also following the family tradition.

Davis Electric Announces Association With Hain, Inc.

It has just been announced that **Hain, Inc.**, formerly of Brooklyn, N. Y., has become associated with the **Davis Electric Co.** Hain, Inc. has recently moved into the new and greatly enlarged plant of Davis Electric Co. at 53 Parker Street, Wallingford, Conn.

★ ★ ★

The seven-year old Hain, Inc. are designers, engineers, and manufacturers of control systems for the automation of a variety of machinery and manufacturing processes and especially the wire industry. The engineers and designers of the company have been associated with control work for many years in the fields of electronics, hydraulics, pneumatics, and motor controls. Numerous master control panels for wire processing systems have been designed and built by Hain and are now installed in some of the largest wire and cable mills in the country.

★ ★ ★

These control systems are for all types of machinery, including wire, special counting systems, electronic pre-set counters and double pre-set electronic counters.

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Sales and service for Hain, Inc. will be handled by Davis Electric Co. This arrangement greatly broadens the activities of Davis Electric Co. as it now permits the company to furnish completely automated systems to the wire and cable industry, including processing machinery with all necessary auxiliary equipment.

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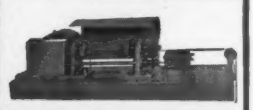
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Improved High Voltage Test Set

A compact, light weight, gas-filled, 50,000 volt AC test set for dielectric testing in accordance with ASTM and MIL standards, is now available in various KVA capacities from **Peschel Electronics, Inc.** (2 KVA unit pictured above weighs 140 pounds, measures 14" x 21" x 23" high including casters.) The single high voltage bushing protrudes 9 inches to facilitate entrance into test cage.

★ ★ ★

The non-flammable gas filling at atmospheric pressure is advantageous from many standpoints: no messy oil with its heavy weight factor and danger of fire or explosion, no solid dielectric encapsulation to add weight and encourage

breakdown due to tracking. The gas filling acts like oil in that it is self-healing and avoids tracking.

★ ★ ★

The remote control cabinet for the 50 KV high voltage section has simplified controls for production testing by inexperienced personnel. A low-voltage interconnection cable permits remote operation of the high voltage section by locating it within a safety enclosure or test cage.

★ ★ ★

This two piece unit, 50 KV at 2 KVA, is our low cost model KB50-2AC. Other voltage and other KVA rated units are available in this series.

★ ★ ★

The control cabinet weighs 38 pounds with interconnecting cable and input cord, and measures 17"W x 9"H x 12" deep.

★ ★ ★

For full details, write Peschel Electronics, Inc., R.F.D. #1, Patterson, N. Y.

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Wire Kinks

(*Continued from page* 985)

strength? And how much would it be worth in terms of mechanical energy?

★ ★ ★

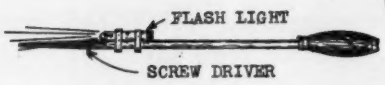
640,000 foot-pounds in 10 hours, by the way, amounts to a little less than 1/30th of one horse power. And that, mind you, was perhaps the best day's work this writer ever turned in.

★ ★ ★

The moral is, of course: do as much of your hard work mechanically as you possibly can.

How to Insert Screws in Dark Places

Here is a handy "kink" for use in the daytime as well as at night. Many a time one has difficulty in seeing the slot in the head of a screw and is obliged to grope and feel around for it.



Flash lamps are now made in such very small sizes that one can be fastened to the shank of a screwdriver as indicated in the sketch. The light accomplishes the purpose very well. With this arrangement one can see a screw slot at any time — night or day.

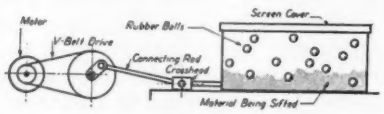
★ ★ ★

The same thing can be done with an oil can to oil a bearing located in a dark or shadowy place without spilling the oil. It saves time and oil and keeps equipment clean.

Most Sieves are Made of Wire

This "Difficult" Sifting Experience May be Worth Remembering

A well known manufacturer was confronted by a sifting problem not long ago — a problem that was causing no end of trouble. The material being sifted was light and more or less fluffy and it refused to pass through the sieve satisfactorily. In other words, the material clogged. Regardless of the number of sieve vibrations per second or other remedies that were tried on the material—too much of it—remained on top of the sieve.



Many suggestions by members of the organization were offered and tried, but they all failed to solve the problem satisfactorily.

★ ★ ★

A mechanical engineer was finally called in "from the outside" — an engineer who had a reputation for solving unusual problems — and he solved this one so easily that members of the company asked each other, "What's the matter with us? Why didn't we think of that simple method?"

★ ★ ★

This engineer simply enclosed the sieve with a screen, placed several hundred toy rubber balls in the enclosure — balls that he purchased at the dime store — and as the sieve vibrated the balls danced around and did their duty. The bouncing balls, too large to pass through the wire mesh themselves, caused the material to pass through with the utmost of ease.

Cook Mfg. Co. Expands

Announcement comes from **Cook Manufacturing Company** (a leading manufacturer of single twist, bunch-stranding machinery) regarding the completion of a new, brick building adjoining their present quarters at 50 East 25th Street, Paterson, N. J.

★ ★ ★

The added space provided by the new, two story structure will permit an increase in output, according to this firm, of about 110% and will be instrumental in shortening delivery time.

★ ★ ★

Said Kenneth Forester, general manager of the Paterson plant: "We anticipate many added advantages in connection with the extra space we have just acquired. We can now enjoy the benefits of greatly enlarged engineering and service departments. This means, of course, that we'll be able to offer our customers more for their money. In addition, we are now able to and are actually beginning to plan an expansion of our existing machinery line."

★ ★ ★

Cook Manufacturing Company designs and builds all types of wire and cable processing and fabricating machines.

George Pelyak

George Pelyak, 47, general foreman of the **Webb Wire Division** of **The Carpenter Steel Co.,** New Brunswick, N. J., died suddenly June 15 of pneumonia. He was a patient at St. Peters Hospital in New Brunswick.

★ ★ ★

Mr. Pelyak had been with Webb Wire for 29 years. He originally joined the company as a laborer, served as a wire-drawer, became foreman in 1952 and general foreman in 1956.

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Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

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Syncro Machine Co., Perth Amboy, N. J.

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Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
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Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

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United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

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Bartell Machine Tool Corp., Rome, N. Y.
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Entwistle Manufacturing Corporation, Providence, R. I.
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Kraft, J. A. Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England

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Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
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United States Borax & Chemical Corp., Pacific Coast Borax Co. Div., New York, N. Y.

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CORDS—Electrical, Tinsel Conductor
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(See MACHINERY—Measuring Wire and Cable)

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Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

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Rivom, Dijon, France
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DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
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Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rivom, Dijon, France

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
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Boulin, Victor J., Inc., New York, N. Y.
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Rivom, Dijon, France

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Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

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Sunbeam Equipment Corporation, Meadville, Pa.

FURNACES—Galvanizing Equipment
Sunbeam Equipment Corporation, Meadville, Pa.
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Wilson, Lee, Engr. Co., Cleveland, Ohio

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Sunbeam Equipment Corporation, Meadville, Pa.

FURNACES—Resistance Heating, Strand
Harper Electric Furnace Corporation, Buffalo, N. Y.
Sunbeam Equipment Corporation, Meadville, Pa.

FURNACES—Salt Bath
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FURNACES—Strand Annealing
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GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

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Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

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Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

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Celanese Corporation of America, New York, N. Y.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
General Tire & Rubber Company, The, Akron, Ohio
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymkraft Division, Plymouth, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

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Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

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Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Company, Harrison, N. J.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

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American Insulating Mach'y Co., Phila., Pa.
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Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Takemura & Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Bobbin Winders
Hanson & Edwards, Ltd., Warrington, England
Larmuth and Bulmer, Limited, Manchester, England

MACHINERY—Bolt, Rivet, Screw, etc.
Behr Machinery & Equipment Corp., Rockford, Ill.
Takemura & Co., Ltd., New York, N. Y.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
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Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio

MACHINERY—Chain Making
Larmuth and Bulmer, Limited, Manchester, England
Pan American Supply Company, New York, N. Y.
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Cold Heading
Behr Machinery & Equipment Corp., Rockford, Ill.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Herborn, Maschinenfabrik, Herborn, Germany
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Steel & Wire Machinery Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Pan American Supply Company, New York, N. Y.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Company, Worcester, Mass.
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Maschinenfabrik, Herborn, Germany
Pangborn Corporation, Hagerstown, Md.

MACHINERY—Diameter Control
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corporation, New York, N. Y.
General Machine Tool Co., Worcester, Mass.
Morgan Construction Co., Worcester, Mass.

Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Flat Wire
General Machine Tool Co., Worcester, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Stanat Manufacturing Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Galvanizing Wire
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Engineering & Manufacturing Company, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia, Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY — Measuring Diam., Insulated Wire
Daystrom-Weston, Industrial Gauges, West Englewood, N. J.

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Paper Clips
Pan American Supply Company, New York, N. Y.

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Pin Making
Takemura & Co., Ltd., New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Hodge Bros. Machine Shop, Ossining, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Printing on Electric Wire
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Machine Tool Co., Worcester, Mass.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
National Mach'y Exch. (Used), New York N. Y.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Ring Forming
Pan American Supply Company, New York, N. Y.

MACHINERY—Rod Mill
Herborn, Maschinenfabrik, Herborn, Germany
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Peschel Electronics, Inc., Towners, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Special
General Machine Tool Co., Worcester, Mass.

MACHINERY—Spooling Tension Controls
Web Controls Corp., West Englewood, N. J.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells Company, Frank L., Kenosha, Wisc.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY— Staple Making
Pan American Supply Company, New York, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Straightening & Cutting
American Laubscher Corporation, New York, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel & Wire Machinery Co., Cleveland, Ohio
Takemura Co., Ltd., New York, N. Y.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth & Bulmer Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Düsseldorf-Rath, Germany
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
General Engineering Company (Radcliffe) Limited, Radcliffe, England
Kraft, J. A., Maschinenfabrik, OLPE/Westf. Germany
Larmuth & Bulmer Limited, Manchester, England
Litzler, C. A., Co., Inc., Cleveland, Ohio
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Machy. Div., Pawtucket, R. I.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing for Dielectric Faults
Peschel Electronics, Inc., Towners, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Thread Rolling
Mettler Machine Tool, Inc., New Haven, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)

Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
American Laubscher Corporation, New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Collins Bros. Machine Co., Wire & Cable Mach'y Div., Pawtucket, R. I.
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—Welded Wire Mesh
E. V. G., Maschinen and Stahl, A.G., Zurich, Switzerland
Schlatter, Ltd., H. A., Zollikon/Zurich

MACHINERY—Wire Weaving
Takemura & Co., Ltd., New York, N. Y.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery —Welding Wire Fabrics)

MACHINERY—Winding Wire
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
General Machine Tool Co., Worcester, Mass.
Kraft, J. A., Maschinenfabrik, OLPE/Westf., Germany
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York 19, N. Y.
Atlas Polar Co., Ltd., Toronto, Ont., Canada
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Maschinenfabrik, Herborn, Germany
Hodge Bros. Machine Shop, Ossining, N. Y.
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Wire and Machinery Co., Cleveland, Ohio
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Takemura Co., Ltd., New York, N. Y.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Fdry. & Mach. Co., Division of Textron Inc., Waterbury, Conn.
Whitacre Engineering & Manufacturing Company, Alhambra, California

MACHINERY—Wire Forming
National Mach'y Exch. (Used), New York, N. Y.
Pan American Supply Company, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Takemura Co., Ltd., New York, N. Y.

MACHINERY—Wire Rope
Larmuth and Bulmer, Limited, Manchester, England
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp., New York, N. Y.
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Company, Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Machine Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAINT BONDING CHEMICALS—
Amchem Products, Inc., Ambler, Pa.

PAINTS—Heat Resisting
Amchem Products, Inc., Ambler, Pa.

PAPER—Insulating
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Cary Chemicals, Inc., New Brunswick, N. J.
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Corporation. New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

PLUGS—for Electric Cord Sets
Electrix Corporation, Ashton, R. I.

PRINTING WHEELS—for Electric Wire
Daniels & Co., Frank, New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M. Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Mettler Machine Tool, Inc., New Haven, Conn.
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Pay-Off
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wood's Sons Company, T. B., Chambersburg, Pa.

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New York Engineering Corp., Yonkers, N. Y.
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Wood's Sons Company, T. B., Chambersburg, Pa.

REELS—Steel, for Rope and Cable
New York Engineering Corp., Yonkers, N. Y.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Boonton Molding Company, Boonton, N. J.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Herculean Reel Company, Rusk, Texas
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Northern Indiana Steel Supply Co., Inc., Michigan City, Indiana
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wood's Sons Company, T. B., Chambersburg, Pa.

REELS & SPOOLS—Wood
American Wood Working Co., Montello, Wisc.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Herculean Reel Company, Rusk, Texas
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Seymour & Peck Div., The Greif Bros. Cooperage Corp., Chicago, Ill.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Pittsburgh Steel Co., Pittsburgh, Pa.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLS—For Flattening Wire
General Machine Tool Co., Worcester, Mass.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—Plastic
Boonton Molding Company, Boonton, N. J.
Hubbard Spool Company Div., The American Pulley Co., Garrett, Ind.
Molded Fiber Glass Tray Co., Linesville, Pa.

Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G. Hagen, (W.-Germany)

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TENSION METERS—for Wire
Boulin Instrument Corporation, Pelham, N. Y.

TESTERS—INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Hodge Bros. Machine Shop, Ossining, N. Y.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila, Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WAXES—for Insulated Wire
Cary Chemicals, Inc., New Brunswick, N. J.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
E. V. G., Maschinen and Stahl, A.G., Zurich, Switzerland
Micro Products Co., Chicago, Ill.
H. A. Schlatter, Ltd., Zollikon-Zurich

WHEELS—for Printing on Electric Wire
Daniels & Co., Frank, New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—Aluminum
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Ball
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Bunched and Stranded
Camden Wire Company, Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Camden Wire Company, Camden, N. Y.
Malin & Co., The, Cleveland, Ohio
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
Camden Wire Company, Camden, N. Y.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corporation, Pressed Steel Div., Cleveland, Ohio
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Metalizing
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio

WIRE—Needle
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
National Lock Washer Company, The, Newark, N. J.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's John A., Sons Corp., Trenton, N. J.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
American Chain & Cable, Page Steel Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Synthetic Thread Co., Bethlehem, Pa.

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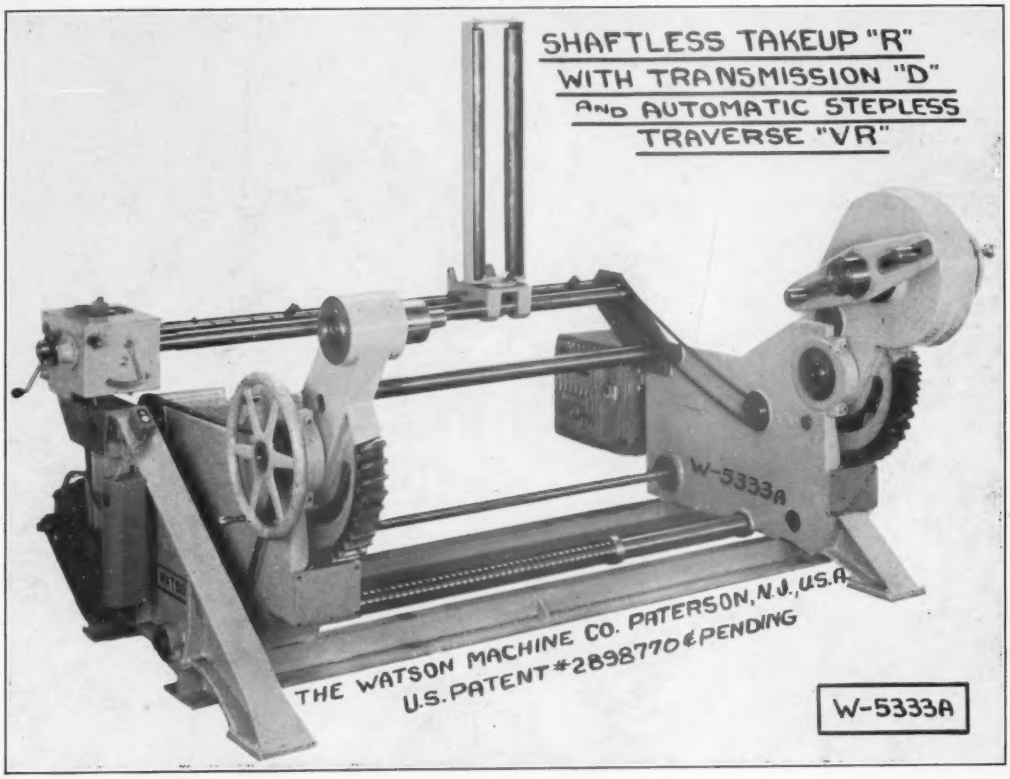

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